3

Project Issues

The federal environmental review process for the Airside Improvements Planning Project (Airside Project) began in August 1995 with the publication by Federal Aviation Administration (FAA) in the *Federal Register* of the Notice of Intent to Prepare an Environmental Impact Statement. Thus began a lengthy period during which numerous federal, state and local elected representatives and governmental bodies, agencies, departments and officials, industry experts, residents of affected communities, business leaders, and other interested parties have provided extensive comments. Following the publication of the Airside Project Draft Environmental Impact Statement (EIS)/Draft Environmental Impact Report (EIR), and based in substantial part on the level of interest, FAA announced that a Supplemental Draft EIS providing additional analysis for public review and comment would be prepared. The FAA convened a special panel of six persons, three of whom were selected by the Governor of Massachusetts and three of whom were selected by the Mayor of the City of Boston. The special panel held 12 meetings that were open to the public. The panel was assisted by information provided by various technical experts and through formal visits to other airports within the region.[1]

The Supplemental Draft EIS process proved beneficial in many respects. In particular the panel process served as an opportunity to introduce new ideas. It assisted the FAA in the specification of additional analytic material to be included in the Supplemental DEIS/FEIR. Fourteen panel recommendations were ultimately incorporated and addressed in the Supplemental DEIS/FEIR. During the process, the panel members were provided with presentations by transportation experts from the academic, consultant and public sectors. The panel sessions were always attended by the public; in particular by representatives from communities, special interest groups and the Environmental Protection Agency (EPA). The Town of Winthrop requested and received permission to tape the sessions for its public broadcast TV channel. Moreover, during the process, FAA and the Massachusetts Port Authority (Massport) consulted and met several times with the Community Advisory Committee (CAC), which represents 24 communities, and their consultants. Ultimately, the process provided the public with an additional opportunity to formally present comments at a second public hearing or in writing on the new analysis that was performed in the Supplemental DEIS/FEIR. The outcome of the supplemental

1 The history of the Airside Project EIS process, including the various public comment opportunities and the special panel process, is set out in Section ES.1 of the Executive Summary of this Final EIS.

process is this Final EIS that has provided the FAA the benefit of substantive new and more current information for consideration in its decision.

The level of public interest and participation, centered principally on the proposed unidirectional Runway 14/32 component of the Preferred Alternative, has provided FAA with a record of extensive public comments. That record has informed the FAA's review on various operational and environmental issues associated with the Airside Project.[2] The analysis in the various EIS documents and the responses to specific comments published as part of the Supplemental DEIS/FEIR and this Final EIS provide commenters with a record of FAA's and Massport's consideration of the various issues raised.

This chapter discusses project issues that were common to a number of comments or that led FAA to examine additional information as part of the analytic effort reflected in this Final EIS. This chapter is not inclusive of the complete body of comments that FAA will consider. FAA's deliberative process has and will continue to consider the entire body of comments.[3]

This chapter examines the following specific issues or areas of additional analysis:

- **Regionalization:** What is the status of efforts to increase utilization levels at other New England airports (Manchester NH, Providence RI, Worcester MA) and other transportation modes (high-speed rail) within the region and are there additional steps that could be pursued within this regional transportation network that would justify eliminating or deferring the Airside Project Preferred Alternative?

- **Demand Management:** Are there administrative actions to manage aircraft demand at Logan that would provide similar operational efficiencies and would justify the elimination or deferral of the Preferred Alternative?

- **Runway Utilization:** What is the expected utilization level of the proposed 5,000 foot unidirectional Runway 14/32 by regional jets, particularly in light of (i) the recent and projected growth of this category of aircraft in the fleets of Logan carriers, and (ii) the recent experiences at other airports (i.e., Baltimore and Philadelphia)?

- **Near-Term Regional Jet Fleet:** Would the operational benefits associated with proposed unidirectional Runway 14/32 change significantly under a near term forecast scenario (i.e., 29 million annual passengers) with a higher number of regional jets than the previous 29 million passenger forecast scenarios analyzed in the Draft EIS and Supplemental DEIS?

2 Over 2,200 comment letters were received in response to the Draft EIS and Supplemental Draft EIS and testimony from approximately 1,000 persons was taken at the various public hearings. The responses to comments received during the Draft EIS/Draft EIR review period were set out in Volumes 4 through 11 of the Supplemental DEIS/FEIR published in May 2001. The responses to the comments to the Supplement Draft EIS received by the FAA are set out in Volumes 2 through 6 of this Final EIS. In addition, the Supplemental DEIS/FEIR and this Final EIS contain substantial additional analysis undertaken in response to various comments.

3 The results of FAA's deliberations on the Airside Project EIS analysis will be set out in FAA's Record of Decision. In addition, Volumes 2 through 6 of this Final EIS provide specific and generalized responses to comments received on the Supplemental DEIS/FEIR.

- **Induced Demand:** Will the implementation of the Preferred Alternative stimulate or induce additional demand for air travel at Logan?

- **Census 2000 Update:** Have the conclusions from the noise impact and environmental justice analyses set out in the Draft EIS and Supplemental Draft EIS changed based on analysis of recently released 2000 Census data?

- **Additional Analysis of Key Technical Issues:** Would an independent analysis support the numbers and types of regional jets in the 29M RJ and 37.5M High RJ fleets? Would a second assessment support the Airside assumptions and analysis regarding regional jet runway utilization, forecast delay savings, and runway capacity?

- **Wind Restriction on Runway 14/32:** What are the operational and environmental implications of restricting the use of Runway 14/32 based on the occurrence of various northwest and southeast wind levels?

- **Safety Benefits:** What are the safety benefits associated with the proposed taxiway improvements and the reduced minimums?

- **Impacts of the Centerfield Taxiway:** What are the environmental and operational impacts of the Centerfield Taxiway? If a decision on the Centerfield Taxiway were deferred so that FAA could conduct an additional study to evaluate potential beneficial operational procedures, how would that affect the operational and environmental impacts associated with the other improvement concepts in the Preferred Alternative?

- **Runway Capacity and Delay Modeling Assumptions:** What was the modeling approach (including various assumptions) used in the aircraft delay analyses set out in the Draft EIS and Supplemental Draft EIS?

- **Consistency of Airside Delay Modeling with Published Delay Statistics**: Are the modeled delay estimates for Logan consistent with published FAA/DOT delay statistics?

The following sections review the responses to these questions.

3.1 Regionalization of the Air Transportation System in New England

As described in the Airside Project Draft EIS/EIR, the Supplemental DEIS/FEIR, and Chapter 1 of this Final EIS, Logan is the cornerstone of New England's airport system, but its role is changing. Great strides in regionalization of the air transportation system have been made in the last decade. Regional airports such as Manchester Airport in New Hampshire and T.F. Green Airport in Rhode Island have become meaningful alternatives to Logan Airport for a growing number of air passengers. High-speed rail has become an option for air passengers traveling to and from New York. The FAA has also invested significant federal dollars in the regional air transportation network, while federal investment in Logan as compared with the other regional airports has been modest. Through individual and cooperative efforts, the regional airports have attracted meaningful airline services and have increased their share of the region's travel demand. These are major achievements that resulted from more than a decade of planning efforts involving many different agencies.

Nevertheless, sound transportation planning in New England requires that efficient use be made of the existing transportation infrastructure at Logan. Even if all the other regional transportation options are effectively implemented, it is still also necessary to implement steps to reduce the existing congestion and delay problems at Logan Airport. Efficient use of Logan is a necessary part of an effective regional transportation solution. Regional transportation studies undertaken since the early 1990s have concluded that expanded roles for regional airports and high-speed rail were needed *in addition to* the proposed airside improvements at Logan Airport.

As documented in Chapter 2 of both the Draft EIS/EIR and the Supplemental DEIS/FEIR, Massport has taken a series of steps to promote and support regional transportation options. Massport continues to promote Hanscom Field as a general aviation reliever airport with niche commercial passenger services. Massport has assumed operating responsibility for Worcester Regional Airport and continues to promote use of Worcester Airport for commercial passenger services similar to those at Manchester Airport and T.F. Green Airport near Providence. Massport's regional transportation planning efforts and commitments are documented in Massport's Section 61 Findings attached as Appendix B of this Final EIS.

The FAA continues to support investments at Manchester and T.F. Green Airports. In addition, the FAA is working with the New England state aviation directors/agencies and regional airport directors on a *New England Regional Aviation System Plan Update* (System Plan Update) to evaluate the performance and potential of regional airports. The last major regional study, the *New England Regional Airport Air Passenger Service Study*, was completed in 1995. The new study will follow a 2-phase approach. Phase 1 will reevaluate regional airport market areas and capture rates; consider their potential for international, charter, and cargo services; examine capacity issues; and study the ability of high occupancy vehicle/ground transportation and rail alternatives to improve regional

airport access. Phase 2 will identify major actions, public policies, and regulations necessary to guide and enhance regional system planning and development. Refer to Appendix C of this Final EIS for the scope of the System Plan Update.

While these regional initiatives will continue to slow the overall passenger growth rate at Logan, the airport must continue to serve its core market area. In addition, slower growth at Logan has already been factored into the Airside passenger forecasts. But most significantly, regional transportation options do not address a significant source of existing and expected future delays at Logan Airport—delays caused by northwest wind conditions. Northwest wind delays at Logan, which inconvenience hundreds of thousands of air passengers each year and cause congestion-related air pollution for neighboring communities, cannot be solved or mitigated through regional alternatives.

The Draft EIS/EIR and the Supplemental DEIS/FEIR extensively examine the potential for greater use of regional airports and other transportation modes to alleviate future demand for Logan services. The Airside Project EIS Documents identify the role that regional transportation options could play and demonstrate that regional efforts are already having an impact on Logan's demand. The EIS Documents also show that the Preferred Alternative is still needed, even with expanded regional transportation options.

This section summarizes the impact of regional transportation options, describes past and present regional planning efforts, and clarifies the role of regional alternatives and the benefits of the Preferred Alternative.

3.1.1 Regional Transportation Planning

There is a long history of region-wide airport planning efforts in New England. Since 1989, a series of regional airport planning studies have examined various strategies for accommodating the growing demand for inter-city travel and relieving congestion at Logan Airport. Each study built upon the conclusions of prior studies and included active participation from the FAA, statewide aviation agencies, and other New England airports. The key regional planning efforts and their principal conclusions are described in Table 3.1-1.

The regional transportation planning studies have consistently recommended the following as essential elements of a comprehensive and balanced regional transportation system for high-speed inter-city travel:

- Development of high-speed rail in the Northeast Corridor;
- A growing role for the regional airports; *and*
- Infrastructure improvements at Logan.

Table 3.1-1
New England Regional Transportation Planning Studies

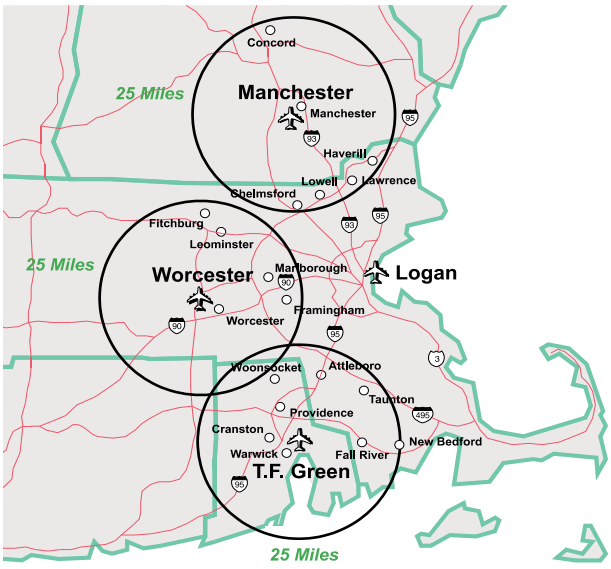
Year	Study	Sponsor	Conclusions
1989	Boston Regional Airport System Study	Massport, Massachusetts Aeronautics Commission (MAC)	Scheduled service at regional airports will recapture some passengers that were using Logan, but growth in demand at Logan will continue. High-speed rail service to New York provides some relief, but there will be a need for a major second airport beyond 2010.
1990	High Speed Rail Benefits Study	Coalition of Northeastern Governors (CONEG)	Electrification of Northeast Corridor rail would shift 2.2 million passengers from air to rail by 2010.
1991	Second Major Airport Study (SMA)	MAC	Developing a second major airport (SMA) would require a 10- to 15-year planning horizon for site selection and environmental review in addition to a multi-year construction period. While the SMA study identified three sites for further study, none of the sites had good access to Logan's core market area and there was significant opposition to siting a new airport anywhere in Massachusetts. Therefore, construction of a second airport is not a solution for accommodating travel demand for the foreseeable future.
1993	Strategic Assessment Report (SAR)	FAA and MAC	High-speed rail, development of the regional airports, and infrastructure improvements at Logan Airport are all needed to accommodate the region's growing demand for inter-city travel. The SAR recognized the importance of Runway 14/32 for reducing delays at Logan and the limitations of peak hour pricing. Further, the SAR clearly stated that peak hour pricing would impose "significant costs to travelers, commuter operators and air carriers, and the local economies of numerous cities and towns."
1995	New England Transportation Initiative (NETI)	Council of New England Governors	Coordinated planning is necessary to enhance the competitiveness of regional airports and the efficiency of the region's air transportation network. Procedural and infrastructure improvements at Logan are also necessary to mitigate increasing congestion and delay at the region's primary airport.
1995	New England Regional Airports Air Passenger Service Study	New England Council, 6 New England States, FAA, Massport and MAC	The study identified sufficient demand at the outlying airports to support improved jet services. The study concluded that expanded jet services, particularly low-fare airline services, at the regional airports would enhance their ability to attract passengers that bypass the regional airports in favor of Logan.
2000	New England Intergovernmental Coordinating Council (ICC)	Council of New England Governors	The first ICC meeting was held in February 2001. The Council established committees to examine opportunities for inter-modal connections and to recommend interstate transportation initiatives. The ICC members are the six state transportation secretaries, Massport, and the regional airport directors.
2001	New England Regional Aviation System Plan	6 New England States, FAA, Massport, MAC, and the Volpe Center	The *New England Regional Aviation System Plan* will evaluate the impact of recent regional airport developments on Logan Airport, identify constraints to regional airport growth, and highlight strategies for optimizing New England's regional aviation system. See Appendix C for the proposed scope for the study.

To facilitate the development of the regional airports, the FAA began prioritizing its Airport Capital Improvement Plan (ACIP) as early as 1990 to reflect the importance of Airport Improvement Program (AIP) funding for development projects at the T.F. Green/ Providence and Manchester Airports. Approximately $200 million of AIP funds have been spent at these airports since 1990. The Preferred Alternative, which is intended to reduce delays at Logan, is an important component of a broader regional transportation strategy that has been evolving for more than a decade.

3.1.2 Impacts of Regional Transportation Options on Logan Demand

Many of the recommendations put forth by the regional planning studies have already proven successful and are having an impact on Logan Airport demand. The regional airports closest to Logan's core service area, defined as the region within Interstate 495 (I-495), have the greatest potential for serving some of the demand that has historically used Logan Airport. These airports include T.F. Green/Providence Airport to the south, Manchester Airport to the north, and Worcester Regional Airport to the west. (See Figure 3.1-1) In 2000, the three regional airports combined accommodated 8.7 million passengers, almost one-third of total passengers at Logan.

Figure 3.1-1
The Boston Regional Airport System

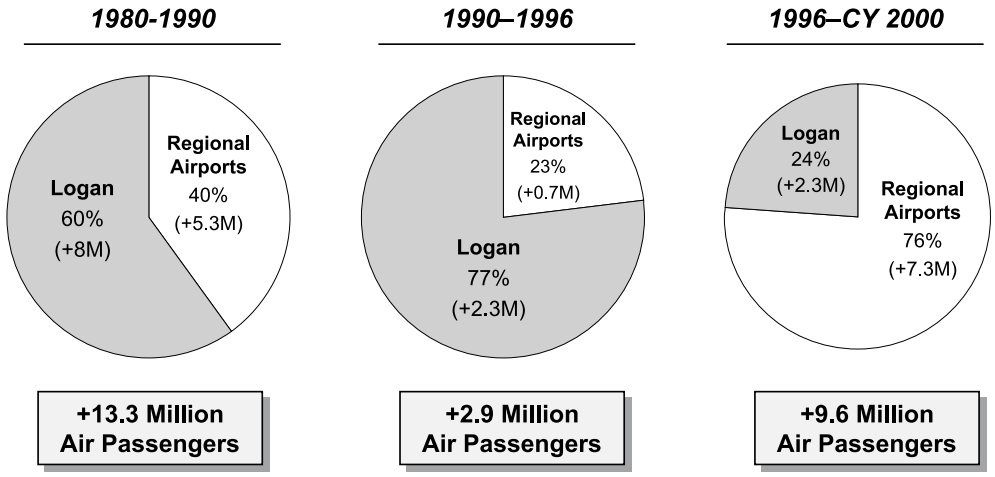


There has been significant service development and passenger growth at the regional airports, especially T.F. Green/Providence and Manchester. Since 1996, the number of air passengers using T.F. Green has more than doubled (+118 percent), while Manchester's air passenger traffic more than tripled (+251 percent). In addition to service expansion by incumbent airlines, T.F. Green and Manchester benefited from the entry of several low-fare carriers including Southwest Airlines, Delta Express and MetroJet. The air traffic growth experienced at these airports includes new air passengers resulting from normal

growth, expanded services, low fares, and diversion from alternative modes, but also reflects diversion from other airports, principally Logan.

The nonstop jet services and lower airfares introduced at these airports increases the overall attractiveness of the regional airports to the traveling public. As a result, the regional airports have recaptured air passengers that originate within their primary market areas but formerly used Logan Airport to meet their air travel needs. Logan's air passenger traffic growth has slowed to just 2.2 percent annually since 1996, compared to 24.9 percent annual passenger growth at the T.F. Green, Manchester and Worcester Airports combined. The slowing of Logan's growth rate at a time when the national and regional economies were rapidly expanding is a clear indication that air service development at the regional airports diverted traffic from Logan Airport. In fact, a comparison of regional passenger growth trends shows that, since 1996, 8 out of 10 net new air passengers in New England have utilized a regional airport rather than Logan. Prior to 1996, the reverse was true with 8 out of 10 new air passengers using Logan. (See Figure 3.1-2)

Figure 3.1-2
Distribution of New England Passenger Growth – Regional Airports vs. Logan



Note: Regional airports include Providence, Manchester, Worcester, Bangor, Burlington, Hartford, New Haven, and Portland.
Source: Airport Records and US DOT, Form 41 schedules.

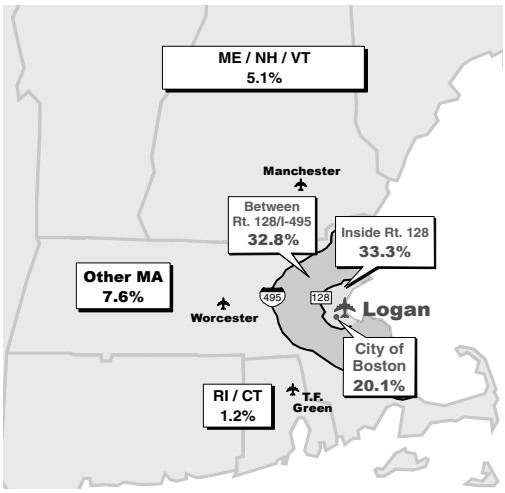
The impact that regional airport development has had on Logan's passenger growth is further demonstrated by Massport's *1999 Logan Air Passenger Survey*, which found that Logan attracted fewer passengers from the region outside of I-495 than it did in 1996. Based on the survey findings it is estimated that Logan attracted 3.3 million passengers from outside I-495 in 1999, compared to 4.8 million in 1996. Over the same period, total Logan passengers increased from 25.1 million to 27.1 million. If the Logan demand that originated from outside I-495 in 1996 had grown at the same rate as demand from inside I-495, Logan would have accommodated an additional 2.4 million passengers, or 29.5 million passengers in 1999. Instead, Logan handled 27.1 million passengers in 1999. (See Figure 3.1-3)

Figure 3.1-3
Logan's Passenger Demand is Becoming More Concentrated within I-495

Distribution of Logan Passengers by Ground Origin

	1996	1999	Change
Boston	21.4%	20.1%	-1.3
Inside Rt. 128	27.7%	33.3%	+5.6
Between 128 & I-495	29.2%	32.8%	+3.6
Subtotal	78.4%	86.2%	+7.9
Other MA	8.6%	7.6%	-1.0
ME/NH/VT	10.5%	5.1%	-5.4
RI/CT	2.5%	1.2%	-1.3
Subtotal	21.6%	13.9%	-7.7

Note: May Not Add Due to Rounding.



Regional rail projects that will have the greatest impact on reducing Logan Airport demand are high-speed services in high-density markets. In December 2000, Amtrak launched high-speed Acela service, the nation's first high-speed rail service, along the northeast corridor from Boston's South Station to Pennsylvania Station in Manhattan and to Union Station in Washington, DC. This service provides relief to Logan by attracting some of the air passenger demand in the Boston-New York market, which is Logan Airport's largest origin-destination market. As of September 2001, Amtrak operates eight daily roundtrips and will continue to add trips as new train sets are delivered.

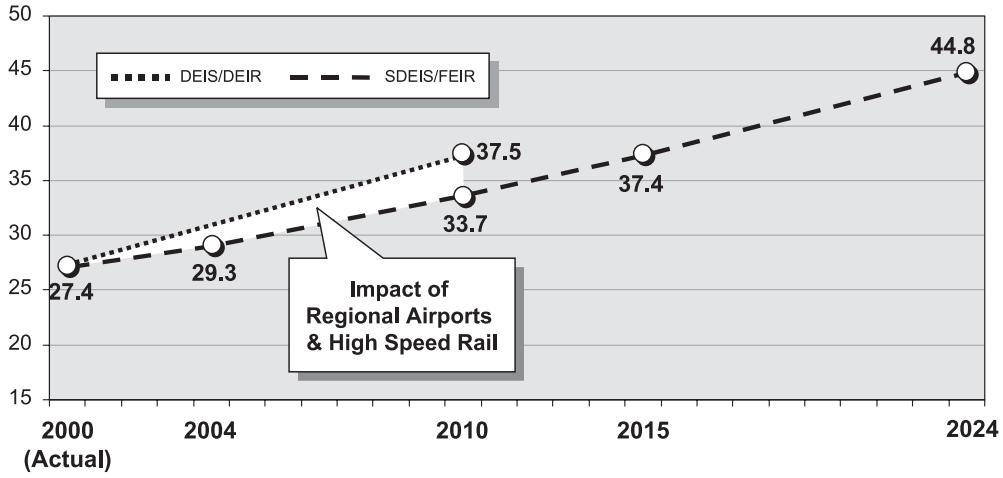
In addition to high-speed rail in the Northeast Corridor other rail lines in New England are being examined. Massachusetts joined with the northern New England states to ask the Federal Rail Administration to designate two additional high-speed rail corridors. In March 1999, Massachusetts, Maine, and New Hampshire jointly filed applications for a Portland-Boston designation, and in August 2000, Massachusetts, Vermont, and New Hampshire jointly filed an application for a Boston-Montreal designation. Federal transportation officials approved both of these applications in October 2000, making the participating states eligible to apply for federal money to fund safety and capacity improvements on higher-speed rail lines.

Other recommended regional initiatives, including the Logan Airside Project and two major runway extensions at Manchester, are in various stages of the planning, environmental review and implementation processes and, when implemented, will take the region even closer to its overall goals.

To reflect the impact that regional transportation options are having and will continue to have on Logan demand, the timing of the Logan passenger forecasts presented in the Draft EIS/EIR was adjusted in the Supplemental DEIS/FEIR. If regional efforts continue to dampen passenger growth at Logan, Logan is expected to reach 34 million passengers

in 2010 and will not achieve 37.5 million passengers until 2015 (Figure 3.1-4). This revised forecast is consistent with the FAA's Terminal Area Forecast for Logan Airport.

Figure 3.1-4
Logan Airport Passenger Forecasts: Impact of Regional Transportation Options (Annual Passengers in millions)



3.1.3 Regional Aviation System Planning Update

In 1995, the FAA, the Massachusetts Aeronautics Commission (MAC) and Massport in conjunction with other New England state and airport directors sponsored the *New England Regional Airport Air Passenger Service Study*. This study, which involved participants from all the New England states, was the first of its kind to examine air service feasibility from a regional perspective without regard to state borders or authority responsibility. The 1995 study and preceding studies were instrumental in guiding regional aviation decisions, and many of their recommendations were successfully implemented.

The FAA, Massport, the MAC, the other New England state aviation agencies and regional airport directors have begun work on the *New England Regional Aviation System Plan* (Regional Aviation System Plan). An FAA grant was issued on August 28, 2001 to both Massport and the MAC to fund this study, and the study commenced in April 2002. It will examine the potential for regional airports to continue to grow, identify developing trends and how they may influence future growth, and discern opportunities that will enhance the operation of New England's regional aviation system. New opportunities include the potential for other transportation modes to either serve as alternatives to air travel or to enable more passengers to access the regional airports.

The Council of New England Governors and other policy decisionmakers throughout the region will be able to utilize strategies and information developed in the Regional Aviation System Plan as a framework for integrated regional aviation policy and planning. The Regional Aviation System Plan will serve as a planning and implementation guide for the regional airports to work cooperatively towards system-wide intermodal improvements. The study will also forecast long-term passenger and

cargo demand for the entire region, identify operational capacity and environmental constraints to growth, and formulate strategies for maximizing regional airport utilization and creating a balanced and efficient regional airport network.

The Regional Aviation System Plan will be conducted in two phases. The objective of Phase 1 is to enhance the region's understanding of current and future demand for passenger and cargo services across the New England region. Phase 1 will focus on forecasting regional aviation activity through 2020 and defining existing and planned facilities for each of the regional airports. It will also characterize the ability of the individual airports to meet forecast demand and will identify where system facility improvements may be needed to enhance the regional transportation system. An important element of this study will be an analysis of intermodal transportation opportunities throughout the region. Finally, it will provide an improved understanding of the inter-relationship among the New England regional airports.

The anticipated products of Phase 1, which is expected to be completed in Fall 2003, are:

- Regional passenger, cargo and fleet forecasts;
- Updated airport service areas;
- Identification of new air service market opportunities;
- An understanding of facility needs to accommodate anticipated growth; and
- A work program for Phase 2.

In Phase 2, an implementation program will be developed. The implementation program is expected to identify major actions, public policies, and regulations necessary to guide and enhance regional system planning and development.

The scope of work for Phase 1 of the study is contained in Appendix C.

3.1.4 Regional Solutions Are Not a Substitute for Airside Improvements at Logan

Even with the successful development of regional transportation alternatives to Logan, there is still a need for the Preferred Alternative. Logan's core market area will continue to generate substantial demand for Logan air services. The analyses in the Draft EIS/EIR and the Supplemental DEIS/FEIR demonstrate that delays caused by airside inefficiencies will persist at Logan even as the use of regional transportation options increases. Despite the tremendous growth at the regional airports and the advent of high-speed rail to New York, Logan continues to experience a high level of flight delays.

There are multiple sources of delay at Logan including: airfield inefficiencies; volume; weather; air traffic control (ATC) delays; airline staffing problems; aircraft mechanical problems and others. Thus, there is no single solution that will eliminate the delays experienced by Logan air passengers. The improvement projects included in the Preferred Alternative specifically address the portion of Logan delays that are caused by inefficiencies in the runway and taxiway systems. The Airside analysis in the EIS

Documents shows that the Preferred Alternative is beneficial at past, current, and future levels of airport activity. If it had been in place in 1998, the Preferred Alternative would have reduced Logan-caused runway delays by 32 percent. At future demand levels, the Preferred Alternative is anticipated to reduce runway-related delays by 21 to 29 percent.[4]

While Logan's normal airfield capacity is approximately 120 operations per hour, the Airport cannot maintain this capacity during moderate to strong northwest wind conditions because of a correctable deficiency in the airfield layout. Logan can only operate on one or two runways during these winds compared to the typical three-runway configurations used in most other visual flight rule (VFR) conditions. Increased utilization of regional airports and rail services will not prevent the decline in Logan's capacity that occurs under northwest wind conditions. Construction of the Preferred Alternative is the only measure that would allow Logan to maintain its normal operating capacity during northwest wind conditions.

3.1.5 Conclusion

Over the past decade, policies to enhance utilization of the regional airports have represented a major priority of the FAA. Successful service development at T.F. Green and Manchester Airports has resulted in extraordinary traffic growth at these airports and has slowed passenger growth at Logan. The FAA continues to promote an increased role for the regional airports through ongoing capital improvement projects and, most recently, through the upcoming *New England Regional Aviation System Plan Update*.

The analysis in the Supplemental DEIS/FEIR indicates that regional airports and rail could divert up to 7.3 million air passengers from Logan over the next decade. However, even with these regional initiatives, Logan will continue to experience serious delays. While increasing the utilization of regional airports and alternative modes are essential goals for the region, they cannot address delays that occur during northwest winds and therefore do not eliminate the need for the proposed improvements at Logan.

4 Excludes additional delay reduction on the taxiway system as a result of taxiway improvements.

3.2 Demand Management

A number of reviewers commenting on the Draft EIS/EIR and Supplemental DEIS/FEIR asked if operational efficiencies could be achieved by utilizing demand management policies to manage Logan's aircraft demand, and thereby eliminate or defer the need for the Preferred Alternative. Demand management at airports represents policies designed to control flight volume and prevent delays that occur when flight activity exceeds the level that can be reasonably accommodated under favorable weather conditions (i.e., airline overscheduling). Various demand management measures can address delays caused by overscheduling. These range from:

- Voluntary programs that encourage airlines to reduce flight volume;
- Market-based approaches that reduce demand by raising the price of using the airfield; and
- Administrative approaches such as slots that strictly limit the number of flights permitted on an hourly basis.

The U.S. DOT and FAA are currently examining the broader policy implications of demand management options at congested airports throughout the United States from both the local and national perspectives. The U.S. DOT and FAA intend to provide airports with a full array of public policy tools as part of a comprehensive aviation strategy that focuses on ways to reduce delays, improve capacity management, enhance competition, and promote the efficiency of the overall aviation system. In connection with this effort, the U.S. DOT published notices requesting comment on the broader policy implications of demand management options at congested airports throughout the U.S. In light of the events of September 11th, those notices have been temporarily suspended until the aviation industry stabilizes. The DOT intends to renew this effort when appropriate.

At U.S. airports, most experience with formal demand management relates to the "High Density Rule" that was established by the FAA in 1968 and imposed slot controls at the three New York area airports (LaGuardia, JFK and Newark[5]), Chicago O'Hare and Washington Reagan National. The efficacy and utility of slot controls have been subjects of controversy for many years. The Wendell H. Ford Aviation Investment and Reform Act of the 21st Century (AIR-21) enacted by Congress in April 2000 provides for the phased elimination of slots at all of the High Density airports except Washington Reagan National. This demonstrates clear congressional policy against the imposition of slot restrictions at U.S. airports. Refer to Section 3.5.2 for a discussion of induced demand as it relates to LaGuardia Airport.

Demand management is fundamentally different from the proposed airside improvements for Logan. While improvements such as Runway 14/32 and the taxiway improvements are intended to improve airfield safety and efficiency, and to reduce delays by increasing the reliability with which Logan can maintain its full runway capacity, demand management is intended to address delays that occur when flights are scheduled beyond the Airport's full capacity. As a result, the elements of the Preferred Alternative

5 Newark slot restrictions were removed in the early 1970s because flight volume had fallen below the limits defined in the High Density Rule.

provide meaningful delay reduction benefits under all current and future scenarios, while demand management provides significant delay reduction benefits only when airline overscheduling conditions are present.

In the Airside Project EIS documents, peak period pricing was evaluated as a demand management mechanism under a wide range of potential future fleet scenarios. This market-based approach was selected from among alternative mechanisms because its pricing approach would avoid potential anti-competitive aspects of slot controls and permit free market decisions to determine the type of airline services offered at Logan.

In addition, while Logan flight activity levels generally fall below the airport's normal runway capacity of approximately 120 flights per hour, Logan does exhibit significant variation in flight demand by season, day of week, and hour of day. Flight activity levels at Logan peak during the summer months; Logan is busier on weekdays than on weekends; and over the day, flight volume peaks during the afternoon and early evening hours. Peak period pricing therefore offers the potential to smooth flight demand by reducing activity during periods of highest demand and encouraging greater utilization of the airport during off-peak times.

The analysis of Logan delays contained in the Draft EIS/EIR and Supplemental DEIS/FEIR found that airline overscheduling does not represent a significant cause of recent delays at Logan Airport. For this reason, peak period pricing was not included in the Preferred Alternative for immediate implementation at Logan. However, airline overscheduling has occurred in the past at Logan, most notably in the early 1990s when three major regional carrier systems (affiliated with US Airways, Delta, and Northwest) were operating at Boston. At that time, peak hour activity exceeded 130 flights per hour during the summer season and delays occurred even in favorable weather conditions. During this period, Massport seriously considered establishing peak period pricing as a means to eliminate airline overscheduling and reduce delays.

The overscheduling conditions that occurred in the early 1990s subsided when one of Logan's three principal regional airlines ceased operations, producing an immediate reduction in flight volumes. Subsequent consolidation in the regional airline industry—notably the establishment of a "triple code share" by Business Express with Delta, Northwest, and American Airlines—helped to prevent a return to the overscheduling pattern experienced earlier in the decade.

However, recent developments at Logan, including the acquisition of Business Express by American Airlines, Delta Air Lines' establishment of a competing regional carrier system, and the emergence of the regional jet within the fleets of Logan's leading carriers suggest that overscheduling could re-emerge as a significant source of future Logan delays. In fact, several of the future fleet scenarios evaluated in the Draft EIS/EIR and Supplemental DEIS/FEIR exhibit peak period flight volumes that exceed Logan's normal operating capacity of approximately 120 flights per hour, causing delays even during VFR weather conditions.

While peak period pricing was not found effective at reducing delays under recent conditions or near-term low fleet scenarios, it was shown to produce significant delay reduction benefits under potential future high fleet conditions. For example, under the 29M Low fleet scenario, which most closely approximates recent flight levels at Logan, the addition of peak period pricing to the proposed airside improvements would have reduced annual runway delays by only 3,000 hours—an incremental gain of just 2.2 percent compared with the 20.6 percent reduction associated with the Preferred Alternative. This limited benefit reflects the absence of airline overscheduling under the near-term 29M Low scenario.

In contrast, under the long-term 37.5M High fleet scenario, overscheduling conditions are assumed to be present with annual flight volume more than 20 percent above current levels. Under these conditions, peak period pricing was estimated to produce an incremental reduction in Logan runway delays of 80,000 annual hours—or 24 percent of baseline delays in the No Action Scenario—if it was initiated in addition to the airside improvements contained in the Preferred Alternative.

The analysis of peak period pricing under a 37.5M High fleet scenario illustrates the effectiveness of demand management tools for reducing overscheduling and associated delays. As shown in Figure 3.2-1, hourly aircraft activity under the 37.5M High scenario would exceed Logan's normal capacity of 120 operations per hour for multiple consecutive hours of the day during a peak summer month. With a peak period pricing program in effect, airlines would reduce hourly aircraft operations to levels below the airport's normal capacity. In this case, peak period pricing was projected to reduce runway delays by over 40 percent by lowering the annual flight volume from 608,000 to 552,000 aircraft operations (Figure 3.2-2).

Because of the substantial delay reduction benefit associated with peak period pricing under future high fleet conditions, an air carrier flight schedule monitoring system was designed and described in the Supplemental DEIS/FEIR. The purpose of the monitoring system is to provide advance warning if airline scheduling patterns would be causing significant delays when Logan was operating on its normal three-runway configurations.

Subsequent to filing the Supplemental DEIS/FEIR, Massport committed in its Section 61 Findings, pursuant to the Massachusetts Environmental Policy Act, to the implementation of an enforceable peak period pricing program at Logan Airport, or an alternative demand management program with comparable effectiveness. The objective of this program will be to avoid or reduce delays associated with overscheduling of Logan Airport's available runway capacity. The purpose behind this commitment is to have a defined demand management program in place before an overscheduling condition occurs. This will allow airlines to make future aircraft fleet and scheduling decisions with advance knowledge of potential future operating conditions at Logan.

The FAA acknowledges that Logan Airport is one of the nation's most delayed airports and that Massport has committed to and will propose to implement a demand management program to reduce overscheduling delays. The FAA expects that any such

program that is proposed for implementation will be consistent with applicable Federal law.

Demand management strategies are designed to address delays due to overscheduling, a problem that does not currently occur at Logan. While there may be a future role for demand management at Logan, this does not eliminate or defer the present need to implement the Preferred Alternative, which produces delay reduction benefits under current and future conditions.

Figure 3.2-1
Comparison of August Weekday Peaking Patterns With and Without Peak Period Pricing – 37.5M High Fleet (Maximum 3-Hour Average)

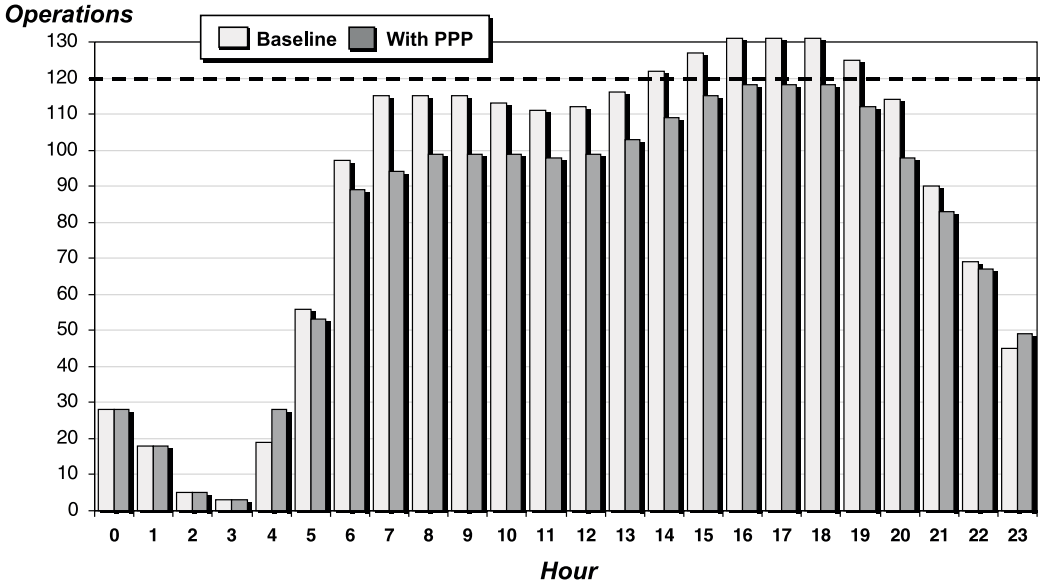
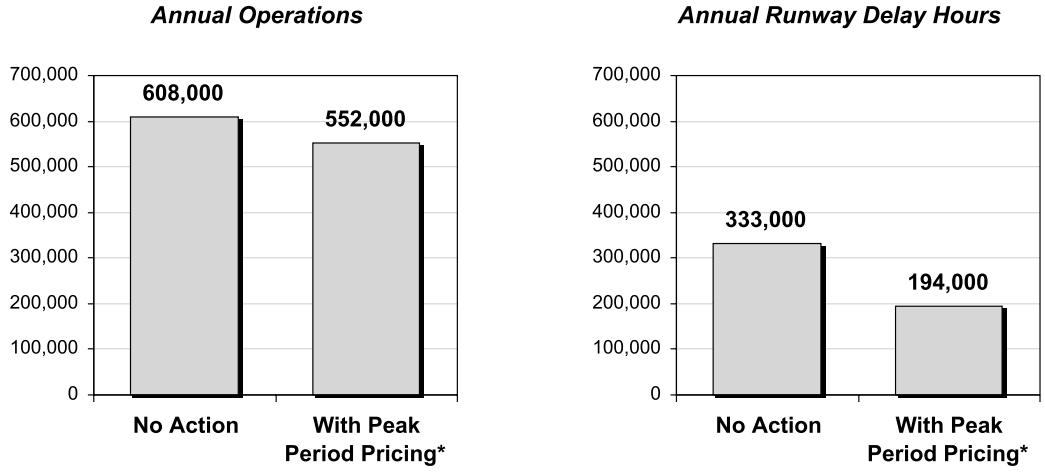


Figure 3.2-2
Impacts of Peak Period Pricing on Operations and Runway Delays – 37.5M High Fleet



* Also Includes Minimal Delay Reduction Attributed to Proposed Reduced Approach Minimums

3.3 Utility of 5,000 Foot Unidirectional Runway 14/32

This section addresses the recent growth of regional jet (RJ) aircraft in the fleets of Logan carriers and the ability of the proposed unidirectional 5,000-foot Runway 14/32 to accommodate these aircraft. Logan has historically received substantial levels of regional airline services operated with smaller aircraft, typically with fewer than 50 seats. This level of small aircraft activity reflects Logan's role as both a major destination point and the primary connecting link between smaller New England communities and the national air transportation system. In the past, regional carriers have principally operated non-jet aircraft, but recent trends at Boston and across the U.S. indicate a dramatic shift into RJ aircraft.

The FAA and Massport have recognized the rapid growth in regional jet aircraft within regional carrier fleets, both nationally and at Logan. Because of this development, the new long-term fleet scenario—the 37.5 million annual air passenger (37.5M) High RJ Fleet forecast was developed during the Supplemental DEIS/FEIR process. An additional near-term fleet, the 29M RJ Fleet, was developed and is analyzed in this Final EIS (see Section 3.4) to supplement the long-term 37.5M High RJ analysis. These new fleet scenarios assess how the growth in regional jets and the decline in turboprop activity affect the operational benefits and environmental impacts of the proposed unidirectional 5,000-foot runway at Logan. The assumptions regarding which RJs would use the runway were developed by an independent FAA analysis (see Appendix C of the Supplemental DEIS/FEIR). In this Final EIS, these RJ use assumptions were reviewed and confirmed by the MITRE Corporation (see Section 3.7.2 and Appendix J). Furthermore, FAA corresponded directly with Logan's two largest regional jet operators, American Eagle and Atlantic Coast Airlines, and received written confirmation of their intention to utilize Runway 14/32 for regional jet landings. Their statements on utilization of Runway 14/32 and a letter from the Air Transport Association of America are included in Appendix F of this Final EIS.[6]

The results of the additional 29M RJ and 37.5M High RJ Fleet analyses (summarized in Section 3.4 of this chapter and Section 4.7 of the Supplemental DEIS/FEIR) are consistent with the results of the previous analyses, which were conducted based on fleet scenarios with far fewer regional jet aircraft and much greater levels of turboprop aircraft activity. The analyses showed that under the near- and long-term RJ scenarios, the recommended Preferred Alternative, which includes Runway 14/32, would reduce annual Logan runway delays by 27 to 29 percent. In addition, the availability of a third runway for operations to the northwest would provide air traffic controllers the opportunity to reduce reliance on the north/south runway configurations and increase activity over the water compared to future scenarios without Runway 14/32.

Comments on the Supplemental DEIS/FEIR from reviewers raised four principal issues related to the growth in regional jets:

- The number of RJs expected at Logan in the future;

6 Appendix F also includes letters of support from other airlines, including United and American Airlines.

- The mix of regional jet aircraft models that will operate at Logan;
- The experience regarding RJ runway utilization at other U.S. airports with 5,000 foot runways; and
- Whether regional jets will utilize the proposed 5,000-foot runway at Logan.

These issues are individually addressed in the responses to the comments set forth in Volumes 2 through 6 of this Final EIS, and in the sections that follow.

3.3.1 Regional Jet Trends

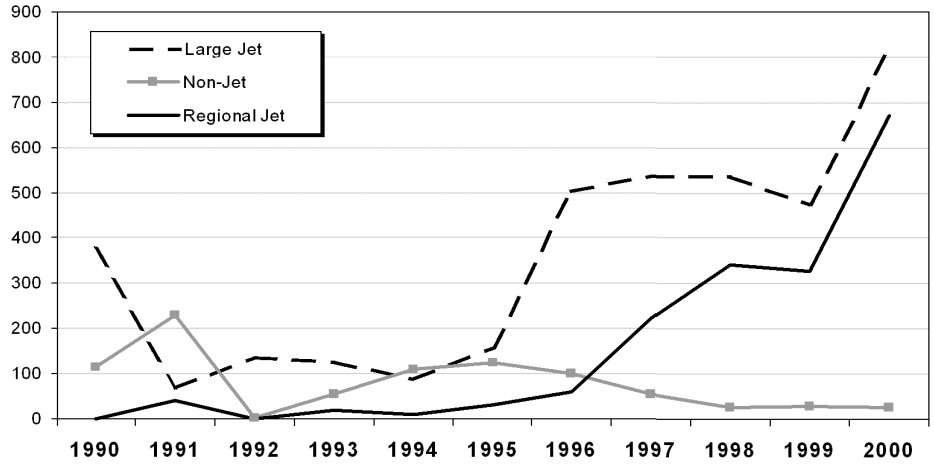
Regional jet models can have between 32 and 90 seats, but most current services are operated with 32- to 50-seat models. These small jets extend the range for regional carrier services to 1,000 miles and beyond (compared to the effective range of approximately 400 miles for turboprop services). They also permit nonstop services in low-volume markets incapable of supporting conventional narrowbody jets with 100 or more seats. In addition, carriers are deploying regional jets to stage competitive entry into high volume jet markets dominated by other carriers. While the initial rapid growth in Logan RJ services reflected only limited direct replacement of turboprops, there are indications that this replacement activity will occur more frequently in the future. For example, Delta Air Lines has used RJs operated by ACJet to partially rebuild its Logan regional feed network that was lost when American Airlines acquired Business Express, which previously operated as a Delta feeder carrier. In August 2001, ACJet was offering 42 daily RJ departures for Delta, flying to destinations previously served with turboprops such as Bangor, Burlington, and Portland.[7]

Figure 3.3-1 shows the influx of regional jets into the fleets of North American passenger carriers since 1990. Until recently, regional jet orders represented a very small proportion of total aircraft orders by these carriers, and only began to increase noticeably in 1995. It was not until 1997 that RJ orders exceeded orders for non-jet aircraft. RJ orders have doubled again since then. While initial regional jet services were focused on feeding connecting hubs, this pattern has recently shifted as carriers have begun adding new RJ origin-destination services into major airports such as LaGuardia and Logan.

Figure 3.3-2 shows the RJ destinations served from Boston in August 2001. New RJ services at Boston include moderate volume markets that historically have supported limited, if any, nonstop services. RJs have begun serving destinations such as Philadelphia and Newark, demonstrating competitive entry into high-volume jet markets dominated by other airlines. RJs are also being used to both supplement and replace conventional jet services in certain markets. Finally, a growing proportion of the current RJ services involve conventional turbo-prop markets.

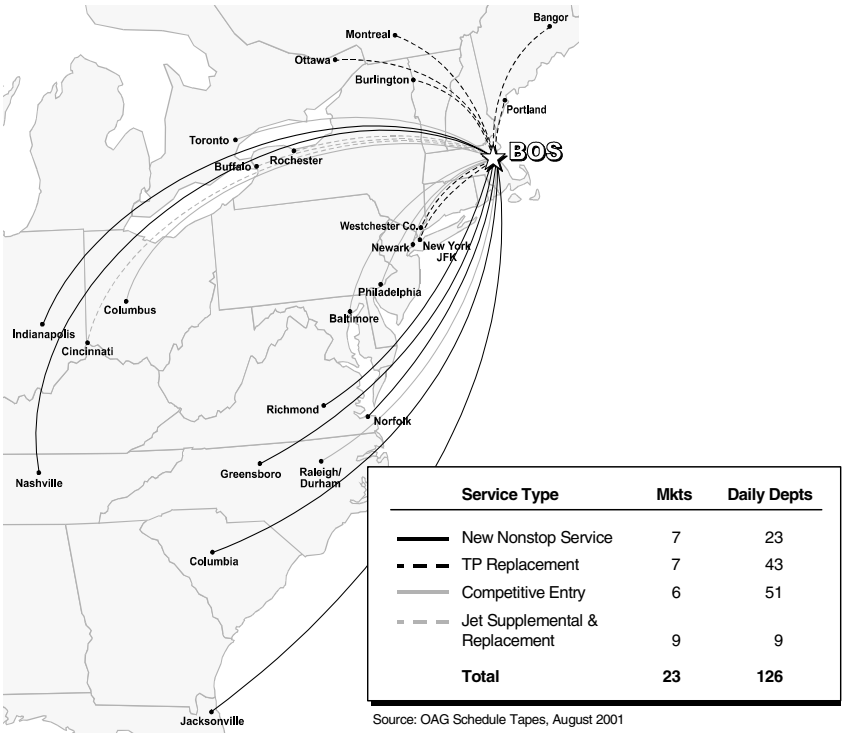
7 Official Airline Guide Schedule Tapes, August 2001.

Figure 3.3-1
Aircraft Orders Placed by North American Passenger Carriers (1990 – 2000)



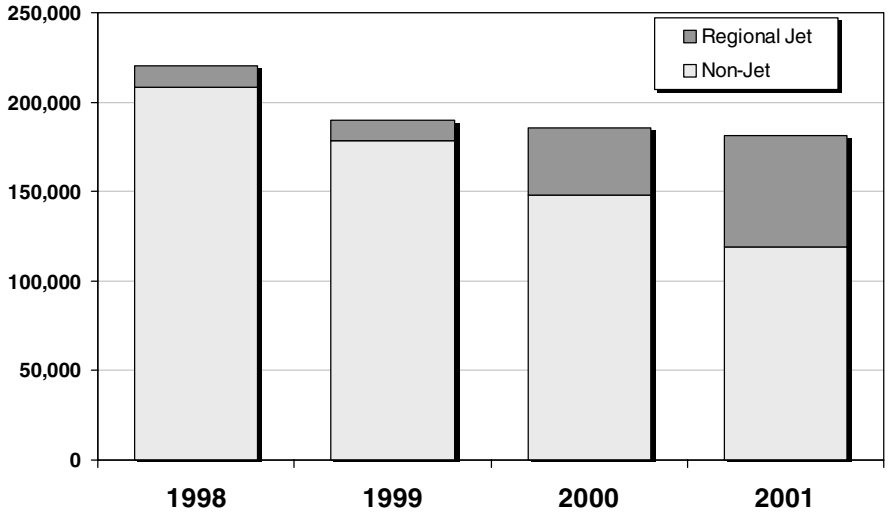
Source: ACAS Fleet Database from AvSoft Limited.

Figure 3.3-2
RJ Markets Served from Logan



In 1998, there were only 12,000 annual RJ operations at Logan, but in 2001, approximately 60,000 annual RJ operations occurred. While this represents a significant increase, Figure 3.3-3 shows total regional carrier operations at Logan actually declined due to a decline in turboprop activity that occurred concurrently with the RJ growth.

Figure 3.3-3
Annual Passenger Operations by Regional Carriers* at Logan (1998 – 2001)



Source: Massport Statistics.
* Regional Carrier in this EIS is used to describe carriers operating aircraft with 75 or fewer seats.

3.3.2 Forecasts of Future Regional Jet Activity

In developing the near-term 29M RJ and long-term 37.5M High RJ forecasts, the FAA and Massport specifically considered recent trends in RJ activity at Logan Airport and the plans of carriers that are likely to have a significant presence at Logan Airport in the future. The terminal redevelopment plans of American and Delta, the orders and options of other Logan carriers, and local and national trends in regional jets were all examined in developing the 37.5M High RJ forecast. The 29M RJ Fleet was developed to represent an interim point between recent conditions and the 2015 37.5M High RJ Fleet. The major forecast assumptions for the two RJ fleets are summarized below:

- Airport passenger traffic was assumed to grow at 2.1 percent per year, reaching 29 million passengers in 2004, and 37.5 million passengers by 2015. This is consistent with the FAA Terminal Area Forecast, which estimates an annual passenger level of 29.2 million by 2004 and a level of 37.3 million in 2015.
- Operations were forecast to fall in between the Low and High scenarios at each passenger level. The 529,000 operations in the 29M RJ Fleet is between the 510,000 and 552,000 projected for the 29M Low and High Fleets, respectively. Similarly, the 585,000 annual operations in the 37.5M High RJ Fleet falls between the 37.5M Low and High levels of 543,000 and 608,000.
- Regional jet aircraft were projected to represent an increasing share of regional carrier operations, with high growth driven by entry into new markets and through replacement of some turboprops and conventional narrowbody jets. Regional jets were assumed to represent 53 percent of regional carrier activity in the 29M RJ forecast, increasing to 74 percent in the 37.5M High RJ scenario. In comparison, regional jets represented 19 percent of regional carrier activity in the year 2000. This high growth in

regional jet operations was assumed so that the fleets test an appropriate upper range of potential regional jet activity.

In 2000, there were approximately 38,000 regional jet operations at Logan, and there were approximately 60,000 regional jet operations in 2001. The 29M RJ Fleet assumes rapid growth to 117,000 annual RJs, and then slower growth to 184,000 annual RJs in the 37.5M High RJ Fleet. These forecasts reflect the assumption that regional jets will continue as the fastest growing segment of Logan operations, with RJ operations more than doubling by 2015.

Some comments from reviewers have raised concerns about the mix of RJ aircraft types in the 37.5M High RJ Fleet and the percentage of regional jet operations by Canadair CRJs in particular. Several of these comments are based on national trends and do not reflect existing and planned RJ use at Logan. While Canadair CRJs make up a large share of national RJ operations, they represent only 14 percent of recent Logan RJ activity. The 29M RJ and 37.5M High RJ Fleets reflect the plans of Logan carriers. While the share of Canadair CRJs is expected to increase, this aircraft is not expected to become the dominant RJ type at Boston. Table 3.3-1 compares the existing and forecast mix of regional jets at Logan.

Table 3.3-1
Current and Future Mix of Regional Jets at Logan

Regional Jet	August Weekday Departures		Percentage of RJ Fleet	
	2001	37.5M High RJ Fleet	2001	37.5M High RJ Fleet
Dornier 328Jet	42	67	33.1%	23.2%
Embraer 135/145	66	156	52.0%	54.1%
Canadair CRJ	18	56	14.2%	19.6%
Other	1	9	0.8%	3.2%
Total	127	288	100.0%	100.0%

There are two key points that support the validity of the forecast mix of RJ types:

- The future fleet mix is very similar to the existing mix of regional jets at Logan. Embraers will continue to be the dominant RJ type, followed by Dorniers and then Canadairs.
- The High RJ Fleet mix is consistent with announced carrier plans. Delta Air Line's terminal redevelopment forecast included significant RJ expansion, with 72 percent of future operations in Dornier RJs and 28 percent in Canadair CRJs. Discussions with American Airlines regarding its terminal redevelopment indicate a significant expansion of Embraer RJ services. US Airways Express carriers Chautauqua, Mesa, and Transtates all have Embraer RJs on order.[8] The announced plans of Logan carriers

8 Mesa Airlines, which does not currently operate at Logan as US Airways Express, also has orders for 70- and 90-seat Canadair CRJs.

lead to the conclusion that Embraers and then Dorniers will be the dominant RJ types at Logan in the future.

Based on these factors, the two RJ scenarios developed for the Supplemental DEIS/FEIR and this Final EIS reflect a reasonable number and mix of regional jet aircraft.

A review of the regional jet fleet forecasts that was performed by MITRE to provide another assessment of the regional jet fleet mix assumptions is described in Section 3.7.1 of this Final EIS. MITRE concluded that the near-term 29M RJ scenario is consistent with current trends and represents a reasonable estimate of the number of RJ flights and the distribution of flights by RJ aircraft type. In addition, MITRE found that the EIS projections for RJ activity in the 37.5 High RJ fleet were within the range of reasonable long-term forecasts.

3.3.3 Regional Jet Performance Characteristics

Given the updated forecasts of regional jet activity, a key question is whether these regional jet aircraft can and will land on Logan's proposed unidirectional 5,000-foot runway. Recent activity and aircraft orders for regional jets are concentrated in the 32- to 50-seat classes with four aircraft models dominating the market: the Canadair CRJ, the Embraer 135 and 145, and the Fairchild/Dornier 328Jet. Each of these aircraft is certificated by the FAA to land on a 5,000-ft. runway under dry conditions, with landing distances reported in Table 3.3-2.

Table 3.3-2
Regional Jet Landing Distances

Regional Jet	Certificated Landing Distance
Canadair CRJ-200	4,850 ft.
Embraer 135	4,200 ft.
Embraer 145	4,413 ft.
Fairchild/Dornier 328Jet	4,284 ft.

Notes: Certificated distances from manufacturer web sites. The distances reflect sea level landings (equivalent to Logan) over a 50-foot obstacle at maximum landing weight, with a dry runway and standard atmospheric temperature and pressure conditions (59 degrees Fahrenheit and 29.92 inches of mercury). Aircraft must be able to stop in 60 percent of this landing distance without the assistance of reverse thrust.

The certificated landing distances reflect conservative safety margins specifically built into the FAA certification process, rather than actual aircraft minimum landing distances (Refer to the Air Transport Association Letter, Appendix F). In particular, the specified distances reflect the certification process requirement that aircraft must be able to stop within 60 percent of the effective length of the runway using brakes and spoilers only (i.e. no reverse thrust). The conservative braking assumptions and the allowance of additional runway length well beyond the actual stopping distance add a significant margin of safety and conservatism to the published distances.

In practice, landing distance requirements would be reduced or increased based upon prevailing operating conditions. Specifically, the length required would be reduced at landing weights less than maximum, with the likely presence of a headwind component and at temperatures less than 59 degrees. On the other hand, the required lengths would increase with a wet runway (by 15 percent) and at higher ambient temperatures.
The principal delay reduction benefits of Runway 14/32 relate to its ability to handle arriving aircraft during northwest winds. These headwind conditions reduce required landing distances by slowing the ground speed of arriving aircraft. Light to moderate northwest winds (e.g., 10 percent of approach speed) can reduce landing distance by nearly 20 percent. Stronger winds have an even more significant effect. For example, a 15-knot headwind could reduce the landing distance of an aircraft the size of the Canadair CRJ at maximum landing weight from 4,850 feet to less than 4,000 feet.

While all of the prevalent RJ models are certificated by the FAA to land on a 5,000-foot runway, the FAA conducted an assessment of this issue to determine the probable utilization of Runway 14/32 by regional jets. This analysis, included in Appendix C of the Supplemental DEIS/FEIR, indicated which RJ models could be assumed to utilize the runway under various weather conditions for the purposes of delay reduction and environmental impact analysis. All Dornier 328Jets were assumed to use the runway under dry and wet conditions, and all Embraer regional jets were assumed to use the runway under dry conditions. The Canadair CRJs (with the longest RJ landing distance) were not assumed to use the runway under any conditions. At Logan, dry runway conditions exist approximately 88 percent of the time, and dry conditions persist even more frequently under northwest wind conditions. Based on these conservative assumptions, it is expected that when Logan is operating in a northwesterly flow, Runway 32 would be acceptable and utilized for arrivals by more than 70 percent of the future RJs projected to operate at Logan under the 37.5M High RJ scenario. Using those same assumptions, nearly 80 percent of Logan Airport's current regional jet fleet could land on Runway 32. Also, the runway will have Global Positioning System (GPS) to enhance instrumentation guidance. Runway 32 Instrumentation is detailed in Appendix G of this Final EIS.

As described in Section 3.7.2, MITRE was asked to provide another assessment regarding regional jet takeoff and landing capabilities. They held discussions with industry representatives and RJ operators in order to validate the EIS runway utilization assumptions that were developed by the earlier FAA analysis (see Appendix C of the Supplemental DEIS/FEIR). The MITRE review confirmed the validity of the EIS assumptions concerning RJ runway use. Moreover, FAA corresponded directly with American Eagle and Atlantic Coast Airlines, the two largest RJ operators at Logan, and received written confirmation of these carriers' intentions to utilize Runway 14/32 for RJ operations. Their statements regarding utilization of Runway 14/32 and a letter from the Air Transport Association of America are included in Appendix F of this Final EIS.

3.3.4 Experience with RJs at Other Airports

Additional concerns regarding runway utilization were raised because of the perception that regional jets are not using runways of similar length located at other airports. While runways at Philadelphia and Baltimore are often cited as examples, the circumstances at these airports differ from those at Logan. The lack of RJ runway use at these two airports is not due to insufficient runway length, but rather to airfield layout and noise restrictions that are unique to those airports and not relevant to Logan.

Similarly, operator requests and planning studies at other airports have indicated a need for runway lengths of up to 7,000 feet to support RJ service. These requests and studies have often been cited as evidence that Runway 14/32 is too short for RJs, but these examples do not apply. In some cases, the airports in question were planning for RJ departures (as opposed to arrivals), while in other cases, the airports were considering the landing distances of larger jet aircraft.

3.3.4.1 Philadelphia

The design of the 5,000-foot Runway 8/26 at Philadelphia was originally intended to provide additional capacity under instrument conditions by separating jet and commuter arrivals. Using Runway 26 for arrivals creates a wake vortex dependency between the arrivals on Runway 27L and the departures on Runway 27R that adversely affects large jet capacity. Hence, the use of the commuter runway actually lowers the capacity of Runway 27R.

In VFR conditions, Philadelphia normally operates on Runway 27L, Runway 27R, and Runway 35, with coordinated arrivals on Runway 35 and Runway 27R arrivals using the Converging Runway Display Aid (CRDA). Replacing Runway 35 with the new Runway 26 produces little or no increase in VFR airfield capacity, and air traffic control reportedly finds it simpler to operate on the existing configuration.

In addition to the wake vortex issues and the lack of increased VFR capacity, the remote location of Runway 8/26 requires a long and complex taxi route to the main terminal area. The runway also has a significant down slope that increases landing distances and could restrict some aircraft from using the runway. It should also be noted that the lack of runway use is not an RJ issue. Philadelphia has significantly more turboprop operations than regional jet operations, and even these turboprops are not using Runway 8/26. The utilization of Runway 8/26 at Philadelphia should increase with the recent commissioning of Precision Runway Monitoring (PRM) equipment.

3.3.4.2 Baltimore

The 5,000-foot Runway 15L/33R at Baltimore-Washington is an extended general aviation runway located adjacent to the general aviation ramp. Due to the proximity of a nearby residential area, the airport has imposed strict noise limits that explicitly prohibit any use of the runway by commercial jets. This noise rule precludes regional jet use of the Baltimore runway. In fact, many general aviation jets such as Lear 35s and Citation IIs are also restricted from using the runway, as are some turboprops such as the ATR-72.

3.3.4.3 Cleveland

Airport operator requests that at least a 7,000-foot landing runway be provided at Cleveland Hopkins International Airport were based on accommodating about 90 percent of all jet landings. This included nearly all narrowbody air carrier jet aircraft, and the landing distance requirements for the RJs in the Cleveland fleet were essentially equivalent to the certification distances described in Table 3.3-2.

3.3.4.4 Conclusion

In summary, because of the specific circumstances at Baltimore and Philadelphia, the reported lack of RJ use provides no evidence as to the adequacy of a 5,000-foot runway for regional jet services. Similarly, the operator requests at Cleveland and the planning studies at other airports have no bearing on RJ landings at Logan because the runway length requirements considered larger jet aircraft and/or takeoff requirements.

3.3.5 Benefits of Runway 14/32 Under RJ Fleet Scenarios

The near-term 29M RJ Fleet and the long-term 37.5M High RJ Fleet were analyzed using the runway use assumptions developed by the FAA's independent analysis. The results of these analyses, as described in Section 3.4 of this Final EIS and Section 4.7 of the Supplemental DEIS/FEIR, were consistent with the findings from the previously developed fleet scenarios. The new analyses showed that the Preferred Alternative would reduce annual Logan runway delays by 27 to 29 percent. Even with a wind restriction in place, Runway 14/32 is predicted to reduce delays substantially (see Section 3.8.

Environmentally, the shift to a higher proportion of RJs does not imply increased noise impacts. Regional jets such as the Embraer 145 are 5 to 10 decibels quieter than recently manufactured Stage 3 jets on take-off and landing, and are also quieter than many types of turboprops currently operating at Logan.

Under the 37.5M High RJ Fleet, the Preferred Alternative would allow air traffic controllers the opportunity to reduce reliance on the north/south runway configurations and increase activity over the water compared to future scenarios without Runway 14/32.

In addition, by improving airfield efficiency and reducing delays, the Preferred Alternative would lead to a reduction in emissions of Carbon Monoxide (CO), oxides of nitrogen (NOx), total volatile organic compounds (VOCs), and particulate matter under 10 microns (PM_{10}) under the 37.5M High RJ Fleet.

3.3.5.1 Sensitivity Analysis

The final step in examining the regional jet utilization of the proposed 5,000-foot runway was a sensitivity analysis of the 37.5M High RJ Fleet. This analysis examined the potential impacts of varying runway use assumptions, and demonstrated that the majority of the delay reduction benefits of Runway 14/32 would be retained even at levels of RJ

utilization significantly below those identified by the FAA's independent review. While this analysis was initially presented in Section 4.7.5 of the Supplemental DEIS/FEIR, additional information regarding the aircraft assumed to use the runway and their impact on runway use is included here.

As explained previously, the FAA's analysis assumed that Dornier RJs would land on Runway 32 under wet or dry conditions, that Embraer RJs land under dry conditions, and that the Canadair CRJs would not utilize the runway at all. These dry runway conditions occur approximately 88 percent of the time at Logan, and even more frequently under northwest wind conditions. Approximately 71 percent of the regional jet fleet could land on Runway 32. Under these conditions, the Preferred Alternative resulted in a 29 percent reduction in runway delays compared to the No Action Alternative. To assess the sensitivity of delays to the regional jet utilization of Runway 32, two other cases were modeled. Under the High RJ Usage scenario, all 32-50 seat regional jets were assumed to land on Runway 32 under all conditions. Under the Low RJ Usage scenario, only the Dornier RJs were assumed to land on the new runway.

Table 3.3-3 presents the sensitivity analysis input assumptions, while Table 3.3-4 presents the results of the study. Under the most optimistic assumption—that all 32-50 seat regional jets use the runway—an additional 8 percent of the fleet is assumed to land on Runway 32, relative to the baseline scenario defined by the FAA. These additional landings resulted in incremental delay savings of 8,900 annual hours or 2.6 percent. The very pessimistic assumption that only the Dornier RJs use Runway 32 means that only 26 percent of the total Logan fleet is assumed capable of landing on Runway 32. This compares to the 41 percent assumed in the baseline scenario. Even under this pessimistic runway use scenario, the Preferred Alternative still saves 76,400 annual hours of delay, a 21 percent delay reduction relative to the No Action Alternative. The delay reduction benefits are relatively insensitive to the percentage of regional jets assumed to use Runway 14/32. This is because there are always non-jet and general aviation aircraft that can utilize the second arrival stream under northwest wind conditions, and even this restricted use provides significant delay reduction benefits.

Table 3.3-3
RJ Assumptions for the 37.5M High RJ Sensitivity Analysis

	Runway 32 Assignment						% of RJs Able to	% of Total Logan Fleet Able to
	Dornier		Embraer		Canadair			
RJ Use Assumption	Dry	Wet	Dry	Wet	Dry	Wet	Land on Runway 32	Land on Runway 32
Baseline	X	X	X				70.8%	40.6%
High RJ Usage	X	X	X	X	X	X	96.8%	48.8%
Low RJ Usage	X	X					23.2%	25.5%

Table 3.3-4 also compares the jet overflights by region for the various scenarios. As expected, the RJ sensitivity analysis shows that under the High RJ Usage scenario, there is a slight increase in over-the-water operations to the east, with a corresponding decrease in operations to the north and south relative to the baseline scenario. Under the extremely conservative Low RJ Usage scenario, operations to the north and south increase and over-the-water operations decrease relative to the baseline scenario. It should be noted, however, that even under this scenario where only 26 percent of the total Logan fleet can use the runway, Runway 14/32 more than doubles predicted over-the-water operations to the east relative to the No Action Alternative. This sensitivity analysis indicates that even under a scenario with limited RJ use of Runway 14/32, the runway would still provide significant delay reduction and environmental benefits.

Table 3.3-4
Results of the 37.5M High RJ Sensitivity Analysis

Alternative	Percent of Jet Overflights by Direction				Annual Delay Hours Saved	Percent Delay Savings
	North	South	East	West		
No Action Alternative	45.2%	44.6%	6.0%	4.2%	N/A	N/A
Preferred Alternative						
Baseline	30.0%	27.5%	21.5%	21.0%	108,700	29.0%
High RJ Usage	29.0%	26.7%	22.4%	21.9%	117,600	31.6%
Low RJ Usage	37.2%	35.9%	14.1%	12.8%	76,400	20.5%

3.3.6 Conclusion

This analysis of regional jets and their potential impacts on the utility of the unidirectional 5,000 foot Runway 14/32 has addressed the four key regional jet issues raised in the comments on the Supplemental DEIS.

Number of Future RJs Expected at Logan

- FAA and Massport have recognized the rapid growth in regional jets and addressed this change with the development of new 29M RJ and 37.5M High RJ Fleets. Regional jet activity under these forecast scenarios represent significant growth beyond today's levels.
- The results of the 29M RJ and 37.5M High RJ analyses were consistent with the other fleets as described in the Draft EIS/EIR. The Preferred Alternative would:
  - Reduce runway delays by 27 to 29 percent;
  - Provide relief to those people subjected to the highest noise impacts while providing controllers with the opportunity to more equitably distribute noise and shift flights to overwater routes; and
  - Reduce emissions of CO_2, NOx, total VOCs, and PM_{10}.

Mix of RJ Types in the Future

- The 37.5M High RJ Fleet mix considered existing RJ activity at Logan, the terminal redevelopment plans of American Airlines and Delta Air Lines, the fleet plans of other Logan carriers, and local and national trends in regional jet activity. The near-term 29M RJ Fleet represents an interim point between current activity and the long-term projections.
- The forecast fleet mixes are consistent with the existing mix of regional jets at Logan and announced carrier plans.

RJ Runway Utilization at Other Airports

- The lack of RJ runway use at Philadelphia and Baltimore is due to specific airfield layout and noise restrictions that are unique to those airports and are not applicable to Logan.
- The reported lack of RJ use of commuter runways at these two airports and others provides no indication that a 5,000-foot runway at Logan could not service regional jet arrivals.

Utility of a 5,000 Foot Runway for Regional Jets

Based on the discussion above, FAA and Massport have concluded the following:

- Each of the primary regional jet types at Logan is certificated by manufacturers and the FAA to land on a 5,000-foot runway.
- Under northwest wind conditions when Runway 14/32 would be used most frequently, headwinds would reduce required landing distances.
- Using the conservative assumptions developed by the FAA's independent analysis, nearly 80 percent of Logan's current RJ fleet and more than 70 percent of the projected 37.5M High RJ fleet would be able to utilize the proposed 5,000 foot Runway 14/32.
- Under even more conservative RJ utilization assumptions, Runway 14/32 still provides significant delay reduction benefits.
- Representatives of Logan's two largest regional jet operators – American Eagle and ACJet – have provided confirmation of their intention to utilize Runway 14/32 if it is constructed. Their written statements to FAA regarding utilization of Runway 14/32, as well as a letter from the Air Transport Association of America, are included in Appendix F of this Final EIS.

3.4 Near-Term RJ Fleet Scenario

This section considers the operational benefits associated with proposed unidirectional Runway 14/32 under a near term forecast scenario with more regional jets than the previous 29 million passenger forecast scenarios analyzed in the Draft EIS/EIR and Supplemental DEIS/FEIR.

The most significant recent development within the U.S. airline fleet has been the rapid growth in RJ aircraft and a corresponding reduction in turbo-prop activity. This trend prompted the development and analysis of a new long-term fleet scenario—37.5M High RJ Fleet—that was reported on in the Supplemental DEIS/FEIR. The analytic findings related to this new fleet scenario were consistent with the results from previously developed fleets and showed that the Preferred Alternative continued to produce significant delay reduction benefits while reducing the number of people exposed to the highest noise levels.

3.4.1 29M RJ Fleet

The 29M RJ fleet was developed for this Final EIS to provide a near-term scenario with a significantly greater number of regional jets than present in the 29M fleets previously examined in the Draft EIS/EIR. Assuming steady passenger growth from recent passenger levels to the 37.5M passenger scenarios in 2015, the 29M passenger level would be reached in 2004. Operations growth rates were projected for the major market segments (Regional Non-Jet, Regional Jet, North American Jet, International, Cargo, Charter, and General Aviation) to reflect conditions anticipated in 2004. This fleet assumed an accelerated growth in RJs and a simultaneous decline in non-jet regional flights. The resulting 29M RJ Fleet has 529,000 annual operations, which is approximately midway between the 29M Low and 29M High fleets analyzed in previous Airside Project documents. Table 3.4-1 compares the 29M RJ fleet with the previously developed near-term fleets analyzed in the Draft EIS/EIR and Supplemental DEIS/FEIR. The MITRE Corporation performed an independent assessment of the 29M RJ fleet scenario. It concluded that the fleet is consistent with current trends and represents a reasonable estimate of the number of RJ flights and the distribution of flights by RJ aircraft type (see Section 3.7.1).

Table 3.4-1
Comparison of Near-Term Logan Fleet Scenarios
(Annual Operations in 000s)

Aircraft Type	2000 Historic	29M Low Fleet	29M RJ Fleet	29M High Fleet
Regional Non-Jets	147.9	197.0	105.5	246.3
Regional Jets	37.6	15.4	117.4	2.9
Conventional Jets	255.0	259.4	265.1	264.2
Cargo	12.3	12.9	13.2	12.9
General Aviation	35.2	25.2	27.9	25.2
Total	488.0	509.9	529.1	551.5

Source: Massport.

3.4.2 Operational Analysis

The Logan airfield modeling methodology, described in Section 3.11 of this chapter, was used to estimate runway capacities, aircraft delays, and runway utilization for the 29M RJ scenario.

Based on FAA's independent review, runway assignments for the 29M RJ fleet were identical to those for the 37.5M High RJ fleet discussed in Section 4.7 of the Supplemental DEIS/FEIR. In regard to regional jet utilization of Runway 32, these assignments are as follows:

- Canadair CRJs were assumed not to utilize Runway 32.
- Embraer RJs were assumed to land on Runway 32 only in dry conditions.
- Dornier RJs were assumed to land on Runway 32 under wet or dry conditions.

The resulting capacities for the 29M RJ fleet are similar to those for the 29M Low fleet except for the Runway 32 configurations. These configurations have lower capacities due to the smaller number of regional aircraft that are assumed capable of landing on Runway 14/32. Appendix D summarizes the capacities of the various fleet scenarios.

The DELAYSIM model was used to estimate the delays and runway utilization for the 29M RJ fleet. Table 3.4-2 compares the delay results for the 29M RJ fleet with the 37.5M High RJ fleet. Under the 29M RJ fleet, the Preferred Alternative provides 54,000 hours of annual delay savings, or 27 percent of Logan's estimated runway delays. This is slightly lower than the 37.5M High RJ scenario.

Table 3.4-2
Total Hours of Runway Delay by Alternative and Fleet Scenario

Alternative	Total Annual Delay Hours of Runway Delay	
	29M RJ	37.5M High RJ
Total Delay		
Preferred Alternative - All except Peak Period Pricing	149,500	263,500
No Action Alternative	203,950	372,200
Delay Reduction		
Preferred Alternative vs. Alternative 4	54,400	108,700
Percent Reduction in Delay	26.7%	29.2%

Table 3.4-3 compares the total jet operations by operating direction for the 29M RJ fleet with CY 2000 jet operations and with the 37.5M High RJ fleet. Without unidirectional Runway 14/32, the north/south communities' share of overflights would grow to 84 percent from the 77 percent that occurred in 2000. With the Preferred Alternative, jet overflights of the north/south communities are expected to decline relative to the No Action Alternative. At the same time, the Preferred Alternative is predicted to increase overwater flights by a factor of 2.5 versus the No Action scenario. With a wind restriction in place to limit changes in runway utilization, there would be less of a shift from north/south operations to overwater flights; however, there would still be more overwater flights and fewer north/south flights when compared to the No Action Alternative (see Section 3.8 of this Final EIS).

Table 3.4-3
Distribution of Jet Operations by Operating Direction

Direction	CY 2000	29M RJ Fleet		37.5M High RJ Fleet	
		No Action Alternative	Preferred Alternative	No Action Alternative	Preferred Alternative
North and South	77%	84%	53%	90%	58%
East (Overwater)	12%	9%	23%	6%	22%
West	11%	7%	24%	4%	21%
Total	100%	100%	100%	100%	100%

3.4.3 Environmental Assessment

Based on a review of changes in delays and runway utilization patterns under the 29M RJ Fleet scenario, the environmental impacts of the Preferred Alternative are projected to be consistent with the other fleet scenarios analyzed in the Draft EIS/EIR and Supplemental DEIS/FEIR. The reduction in delays and taxiway congestion will translate into fewer nighttime flights and less noise and engine emissions on the airfield. Increased

overwater flights and a more equitable distribution of arrivals and departures will provide relief for the population exposed to the highest noise levels. Since the 29M RJ fleet has no Stage 2 aircraft and fewer hushkitted aircraft, the total noise exposure will be lower than the 29M Low fleet exposure presented in the Supplemental DEIS/FEIR.

3.4.3.1 Air Quality

The 29M RJ fleet emissions inventory for the pollutants NOx, CO and VOCs and for all airport-related sources (e.g., aircraft, GSE, fuel storage, motor vehicles and stationary sources) is compared in Table 3.4-4 with the results for the 29M Low, 37.5M High RJ and 37.5M High fleets.

Table 3.4-4
Comparison of 29M RJ Scenario Air Quality Inventory with Other Fleets

Pollutants*	29 M Low		29 M RJ	37.5M RJ	37.5M High
	LDMS	EDMS	EDMS	LDMS	LDMS
NOx	2,157	2,896	2,795	2,628	2,815
VOCs	945	790	807	812	1,005
CO	5,239	6,092	6,747	4,958	5,623

* Tons per year
LDMS Logan Dispersion Modeling System
EDMS Emission Dispersion Modeling System Version 3.2

From these results, the following conclusions can be drawn:

- Total NOx emissions are either less than, or bracketed by, the 29M Low and 37.5M High RJ results.
- Total VOC emissions are either less than, or bracketed by, the 29M Low and 37.5M High RJ results.
- Total CO emissions are about 10 percent more than previously reported due to differences in the EDMS and LDMS models and the difference in fleet mixes. However, this variance is not significant because the CO dispersion modeling results reported in the Draft EIS/EIR and the Supplemental DEIS/FEIR are well within the air quality standards for this pollutant (e.g., less than 10 percent).

Finally, the air quality analysis results reported in the Airside Project EIS documents consistently showed the Preferred Alternative as having impacts that are either better than, or indiscernible from, the No Action Alternative. This is attributable to the improved airfield operating conditions associated with the Preferred Alternative. The same is true for the 29M RJ fleet scenario. That is, the Preferred Alternative will have beneficial impacts to air quality, or will remain indistinguishable, when compared to the No Action Alternative.

3.4.3.2 Noise

To assess the noise impacts of the 29M RJ scenario, its fleet composition and runway utilization were compared with the 29M Low, 37.5M High and 37.5M High RJ scenarios. Table 3.4-5 presents a summary of key subsets of operations for the four fleets. These key groups have a significant bearing on noise exposure around Logan because of the loudness and frequency of the aircraft types as well as their effect on runway use. Of particular interest are the conventional jet aircraft, the former Stage 2 jets that have been retrofitted with hushkits to comply with Stage 3 noise standards, and the regional aircraft operations comprised of both turboprops and regional jets.

Table 3.4-5
Comparison of Key Fleet Indicators for the 29M RJ Scenario

Key Indicators	Annual Operations (000)			
	29M Low Fleet	29M RJ Fleet	37.5M High RJ Fleet	37.5M High Fleet
Conventional Jets	259.4	265.1	278.8	310.1
B727 Aircraft	19.0	10.9	0.0	6.3
Total Hushkitted Aircraft[1]	39.8	36.8	12.3	22.0
Regional Turboprops	197.0	105.5	64.9	234.6
Regional Jets	15.4	117.4	184.4	19.0

1 Including B727

Note that the number of operations by the loudest jets (i.e., B727 and other hushkitted aircraft) and the total number of conventional jets in the 29M RJ fleet fall between the 29M Low and the 37.5M fleets. This indicates that the total noise of this fleet and thus the *size* or area of each 29M RJ contour is likely to fall between the corresponding 29M Low and 37.5M High contours presented in the Supplemental DEIS/FEIR.

The equivalent jet operations data show that the 29M RJ activity generally falls between the corresponding levels for the 29M Low fleet and the two 37.5M fleets. This and the prior fleet mix comparison indicate that the 29M RJ contours will generally lie between the corresponding 29M Low and 37.5M contours presented in the Supplemental DEIS/FEIR. For individual runway ends, the 29M RJ changes are also generally between the corresponding values for the 29M Low and 37.5M fleets. This indicates that the differences in noise exposure produced by the Preferred Alternative versus the No Action Alternative for the 29M RJ fleet would be similar to those presented in Chapter 6 of the Supplemental DEIS/FEIR for the other fleets.

3.4.4 Conclusion

The 29M RJ fleet represents a near-term scenario of Logan activity that anticipates continued growth in regional jets at Logan Airport. Total annual operations of 529,000 in the 29M RJ fleet are between the 29M Low fleet and the 37.5M High and 37.5M High RJ fleets. The 29M RJ fleet assumes growth in regional jet operations to a level of 117,000 in 2004. Analysis of this fleet confirms that the environmental and operational benefits associated with the Preferred Alternative under the near-term RJ fleet are consistent with the other seven fleet scenarios studied in the Draft EIS/EIR and Supplemental DEIS/FEIR, namely:

- The Preferred Alternative will reduce runway delays by 27 percent over the No Action Alternative, saving over 54,000 hours of flight delays per year.
- Runway 14/32 will reduce reliance on the north/south runway configurations at Logan, and will increase the number of overwater operations relative to the No Action Alternative.
- Runway 14/32 will provide the opportunity to improve PRAS performance in comparison to the No Action Alternative. It will also permit improvements in the short-term PRAS performance, providing relief from continuous overflights to the surrounding communities.
- The Preferred Alternative will have beneficial impacts in terms of air quality, or will remain indistinguishable, when compared to the No Action Alternative.
- The noise exposure impacts of the Preferred Alternative over the No Action Alternative have been bracketed by previous analyses. In all cases, the number of residents exposed to the highest noise levels will be reduced by the Preferred Alternative.

3.5 Unidirectional Runway 14/32 and its Potential to Induce Demand

Many comments on the Supplemental DEIS/FEIR suggested that construction of unidirectional Runway 14/32 and implementation of the other proposed airside improvements could independently stimulate an increase in passenger traffic or aircraft operations at Logan Airport. However, for the reasons set forth in the following discussion, the FAA believes that the Preferred Alternative will not induce demand for aircraft operations or passengers over and above the levels that would otherwise occur absent the proposed improvements.

As has historically been the case, growth in demand at Logan will be principally driven by three specific factors:

- Local and national economic growth – As the economy grows, jobs are added and personal income rises. This results in an increased demand for air transportation services.
- Increased competition and reduced pricing within the transportation industry – The availability of low fares can often stimulate air travel demand. For example, when Southwest Airlines began providing low-fare service to Providence and Manchester, demand at these airports grew quickly.
- A change in the distribution of air services between Logan and the regional airports, and the availability of other transportation modes – The availability and pricing of services can influence travel decisions, and thus the level of demand at an airport. For example, the recent increases in jet services at T.F. Green and Manchester have increased the demand for these airports and reduced the demand at Logan. The advent of high-speed rail service between Boston and New York City is similarly expected to divert air shuttle traffic at Logan.

During the two decades from 1980 to 2000, Logan's air passenger levels grew at an average annual rate of 3.1 percent per year, without any significant airfield construction. This growth contributed significantly to the congestion and delay at Logan that the Preferred Alternative is designed to address. Based on the last decade of activity, Massport and the FAA have forecast 2.1 percent annual passenger growth from recent levels to the 2015 level of 37.5 million passengers. This projected growth is consistent with FAA's FY 2000 to FY 2015 Terminal Area Forecast (TAF) for Logan Airport, and is expected to occur whether or not Runway 14/32 is constructed.

The historic growth that occurred without accompanying airfield improvements clearly demonstrates that demand at Logan is driven by the economic and market factors described above, not airfield construction. However, the FAA undertook additional review of the induced demand issue for this Final EIS, through examination of experiences at other airports and their relevance to Logan.

For an airport action to stimulate or induce demand, an existing gap between demand and capacity must be removed or corrected by the action. These points are illustrated by the experiences at the Dallas/Fort Worth and LaGuardia Airports. At Dallas, the major hubbing carrier, American Airlines, drove the decision for a new runway in order to add flights to its connecting hub operation. In contrast, regulatory actions at LaGuardia previously held demand in check, but removal of those regulatory restraints with the passage of AIR-21 caused the airport to be overwhelmed by pent-up demand. These two examples are useful in examining the relationship between airport runway capacity and demand, and the factors that result in induced demand.

3.5.1 Comparing Infrastructure Improvements at Dallas-Fort Worth to the Addition of Runway 14/32 at Logan

When a new runway (35R/17L) and an airspace reconfiguration were implemented at Dallas-Fort Worth in 1996, triple and quadruple independent arrival streams were allowed under IFR and VFR conditions, respectively. Hourly arrival capacities increased from 102 to 146 under VFR conditions, and from 66 to 108 under IFR. Immediately after this capacity expansion, American Airlines increased its peak activity levels from approximately 250 hourly operations to a level of 300 hourly operations.[9] This is an example of a capacity enhancement project resulting in induced demand. The runway construction project increased overall airfield capacity by a significant margin, and this increase stimulated the latent demand for this additional capacity that already existed due to the strategic position of the Dallas connecting hub in the route system of American Airlines. The new runway was designed with the specific objective of increasing capacity to accommodate higher levels of demand, particularly for connecting passengers. In contrast to Dallas, Logan is not a connecting hub for any major airlines.

Unlike the Dallas runway project, the proposed unidirectional Runway 14/32 will not increase Logan's normal operating capacity. The Preferred Alternative, specifically unidirectional Runway 14/32, will not change Logan Airport's typical airfield capacity of approximately 120 operations per hour that is available about 80 percent of the time, nor will it encourage or induce an increase in aircraft operations. Instead, unidirectional Runway 14/32 will allow Logan Airport to operate more reliably by maintaining this capacity during periods of moderate to high northwest winds that now reduce Logan's operating capability from the three-runway configurations typically available to configurations with just one or two runways. Unidirectional Runway 14/32 will increase Logan's reliability, but will not increase the airport's normal hourly throughput. This conclusion is consistent with FAA's *Airport Capacity Benchmark Report 2001*,[10] which determined that Logan has an existing good weather capacity of 118 to 126 operations per hour. The *Benchmark Report* also concluded that the new unidirectional runway would not increase the good weather capacity of Logan Airport, but instead would help mitigate delays encountered during adverse wind conditions.

9 Hansen, Tsao, Huang, and Wei, *Empirical Analysis of Airport Capacity Enhancement Impacts: A Case Study of DFW Airport*, July 1998, pgs 1,12.
10 *Airport Capacity Benchmark Report 2001*, Federal Aviation Administration, April 2001.

Preventing these northwest wind delays will represent a benefit to the passengers and airlines that currently experience them; however, those passengers using the airport during other weather conditions may experience little or no delay reduction benefit from the runway. These northwest wind conditions and the associated aircraft delays are not regular or predictable and cannot be anticipated by airlines or passengers. Passengers who are flying in or out of New England to a destination most conveniently served by Logan Airport do not make a decision about whether or not to fly based on the possibility of reduced capacity due to northwest wind conditions. New England weather cannot be predicted with any certainty. Likewise, decisions by air carriers to add service to and from Logan do not depend on increases in the availability of Logan's three-runway capacity. Implementation of the Preferred Alternative is not expected to influence the way airlines schedule flights to and from Logan Airport, or whether or when air passengers will decide to fly in or out of Logan Airport. As these delays due to northwest winds are not part of the rational consumer decision-making process, preventing these delays will not stimulate growth in Logan passenger demand above and beyond the rates that would have occurred absent the proposed runway.

3.5.2 Comparing the Impact of AIR-21 at LaGuardia to the Impact of Constructing Runway 14/32 at Logan

Flight activity at LaGuardia was constrained for many years by slot controls that limited the airport to approximately 71 flights per hour (68 scheduled flights and three non-scheduled primarily used by the general aviation community). While additional demand for services existed, that demand remained unsatisfied until Congress passed AIR-21 in April 2000. This legislation allowed carrier exemptions to the slot controls, provided that they served small- and non-hub airports and used Stage 3 aircraft with 70-seats or less.

In the months following passage of AIR-21, exemption requests for more than 600 flights were filed with U.S. DOT. By September 2000, air carriers had added nearly 200 scheduled daily flights at LaGuardia, with plans to add more than 300 additional flights by January 2001. This dramatic growth in operations produced record delays, with flights scheduled far in excess of airport capacity, even in favorable weather conditions. Average delays at LaGuardia reached 43 minutes per flight during September 2000.[11]

Based on the unacceptable level of delays and the prospect of even more flights being added, the FAA, at the request of the Port Authority of New York and New Jersey, instituted a temporary slot lottery to constrain the number of hourly flights at LaGuardia to 81 operations (75 scheduled and 6 non-scheduled). This level represents the current practical capacity of the airfield. With this temporary lottery in place, delays have declined significantly, but the lottery will ultimately be replaced by an alternative demand management system designed to limit flight activity at the airport.

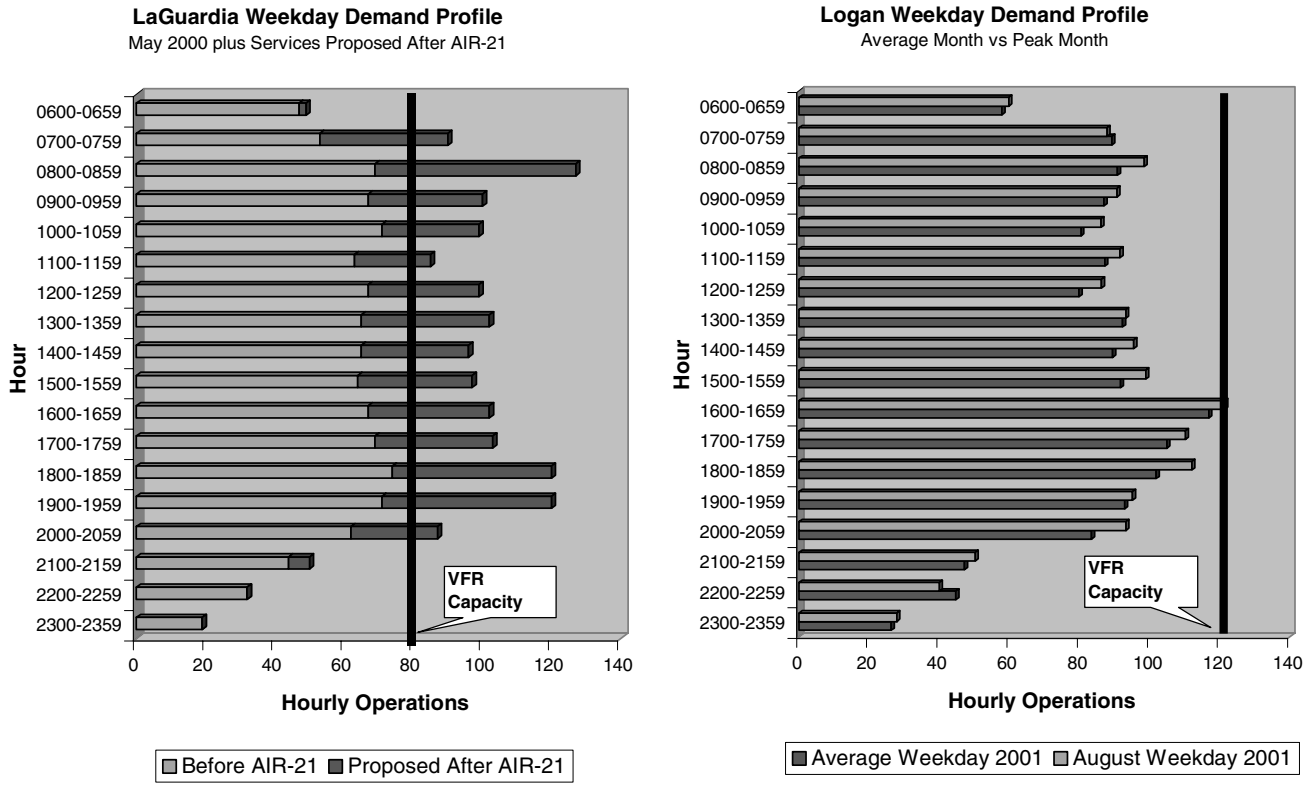
Logan and LaGuardia are fundamentally different because air traffic demand at LaGuardia greatly exceeds the capacity of the airport. This disparity between capacity and demand exists at LaGuardia, but not Logan, because LaGuardia has only two runways

11 See FAA Docket No. FAA-2000-8278; Notice of Lottery of Slot Exemptions at LaGuardia Airport.

and serves a market that is many times larger than Boston. It is this latent but administratively suppressed demand that was stimulated by AIR-21, resulting in induced demand at LaGuardia. As shown in Figure 3.5-1, in an unconstrained environment LaGuardia carriers announced plans to schedule flights well beyond the good weather capacity of the airport. At Logan, even during the peak summer month of August 2001, activity was below the Airport's VFR capacity through nearly all hours of the day. During an average month, Logan's demand is below its VFR capacity all day long.

While the LaGuardia example clearly illustrates the case of induced demand due to relaxation of a regulatory constraint, it is important to remember that Logan's situation is different. At Logan, carriers are not currently suppressing schedules. Demand is held in check by neither regulatory constraints nor capacity limitations. Instead, airlines are providing services based on market demand and internal strategic objectives. The increased reliability associated with unidirectional Runway 14/32 is not expected to impact either of those factors.

Figure 3.5-1
Comparison of Logan and LaGuardia Demand Profiles



Note: Includes Additional Services Proposed as of April 19, 2000.
Source: OAG Schedule Tapes.

Note: Average Weekday estimated based on 2000 schedules.

Comparatively low passenger load factors at Logan provide further evidence that flight schedules are not being artificially depressed by delay conditions. In 2000, Logan had an average load factor of 61 percent, compared to 68 percent for the U.S. as a whole. In fact, of the 31 Large Hub airports (those with more than one percent of scheduled enplanements), Logan is ranked 30th in terms of load factor.[12]

3.5.3 Conclusions

The Preferred Alternative will not independently increase passenger or flight demand at Logan. Instead, growth in demand will be principally driven by local and national economic conditions and by competition and pricing within the airline industry. While a new runway, such as the one in Dallas, can stimulate demand by increasing capacity, this is not the case at Logan. The FAA *Benchmark Report* concluded that the new unidirectional runway would not increase the good weather capacity of Logan Airport, but instead would help mitigate delays encountered during adverse wind conditions. Runway 14/32 will increase Logan's reliability, but will not increase the Airport's normal operating capacity. Furthermore, Logan's situation is also unlike that at LaGuardia, where demand that exceeds capacity has been constrained by regulatory action. Airlines at Logan are providing services based on market demand, and they are already providing as many seats and frequencies as required to meet this demand. Since there is no latent demand that Runway 14/32 could activate, the increased reliability associated with Runway 14/32 will not induce additional demand at the Airport. Furthermore, the broad range of forecasts that were considered in the Airside Project operational and environmental analyses encompass all of the potential impacts that would be associated with any growth scenario.

Based on the factors driving Logan demand, the fact that construction of unidirectional Runway 14/32 does not increase the maximum throughput of the Airport beyond the 120 hourly operations typically available under good weather conditions, and the fact that demand at Logan is not constrained, the FAA concludes that Runway 14/32 will not in any measurable or meaningful way induce or stimulate additional demand for air passengers or operations at Logan Airport.

12 U.S. Department Of Transportation T100 Database, Calendar Year 2000.

3.6 Census 2000 Update

The U.S. Bureau of the Census began to release Census 2000 population data results for Massachusetts on March 21, 2001 approximately one week after the Supplemental DEIS/FEIR was filed. The release of the Census 2000 data prompted several commenters to note that the availability of the 2000 population data might affect the conclusions presented in the Draft EIS/EIR and the Supplemental DEIS/FEIR regarding the noise impact and Environmental Justice analyses.

To address these concerns the noise effected populations for all of the Project Alternatives and all of the fleet scenarios presented in the Draft EIS/EIR and the Supplemental DEIS/FEIR have been recalculated using the new Census 2000 data. This section summarizes the noise-exposed populations for the No Action and Preferred Alternatives using Census 2000 data and focuses on the 29M Low fleet and the 37.5M High fleet, which have been shown to bracket the range of likely noise impacts. (The updated populations for all other alternatives and fleet scenarios can be found in Appendix H.) This section also includes an updated Environmental Justice analysis based on the newly released Census 2000 population data. It should be noted that this section analyzes the impacts of the Preferred Alternative with no wind restriction in place. The population and Environmental Justice impacts of the Preferred Alternative with a wind restriction are discussed in Section 3.8.

As described in the following sections, the use of the updated Census 2000 population data does not alter the noise impact or Environmental Justice conclusions presented previously in the Draft EIS/EIR and the Supplemental DEIS/FEIR. It is important to point out that changes in the U.S. Census Bureau's geographic coordinate system have occurred between 1990 and 2000, and these influence the new population counts, independent of any impacts associated with the Preferred Alternative. Several of the more significant differences in the two censuses are discussed briefly below.

3.6.1 1990 and 2000 Census Differences

Aside from actual demographic changes that have occurred since the 1990 Census, differences between the 1990 and 2000 Censuses also reflect changes in the locations of population centroids.[13] Population centroids have shifted location from 1990 to 2000 for a variety of reasons and new centroids have appeared in the Census 2000.

First, the locations of all centroids throughout the U.S. have shifted from the 1990 Census as a result of an update of the Census Bureau's geographic coordinate system. For the Census 2000, the Census Bureau conducted a complete update of the map coordinate system using GPS (Global Positioning System) technology as opposed to earlier geometric computations based on block boundaries from survey data. The 1990 Census utilized centroids whose latitudes and longitudes were reported in degrees, minutes, and seconds and were determined from what is known as NAD27 survey data, the origins of which date

13 A population centroid is the single point within a census block to which the entire block population has been assigned by the U.S. Census Bureau.

back to the "Clarke Survey" of 1866. On the other hand, the 2000 Census is based on updated North American Datum (NAD) 83 survey data, which uses satellite information and an earth-centered coordinate system to determine the latitude and longitude of each centroid, and the locations are reported in decimal degrees to six significant figures giving greater accuracy to the positions of the centroids. This methodological change to census geography has caused all population centroids to shift slightly in location, by approximately 50 to 150 feet.

In addition, some population centroids have shifted location as a result of actual demographics shifts within census blocks. For example, new construction in a census block could cause the population centroid for that block to shift location. In other cases, the population growth has been significant enough to warrant the addition of new centroids. For example, new centroids were added in Roxbury to reflect the new Suffolk County Prison and in Quincy as a result of the Quincy Bay Marina development. Finally, some centroids have shifted location because of decisions by the Census Bureau to alter the block boundaries, correct previous errors, improve reporting accuracy, or other factors. An example of this type of shift is the single centroid representing Long Island, which moved from the north end of the island to the south end without any significant change in population.

These factors together mean that not only has the population associated with each centroid changed from 1990 to 2000, but also some centroids may have shifted into or out of a noise contour interval simply because the position has been reported more accurately in the 2000 Census.

3.6.2 Updated Noise Exposed Population Analysis Using Census 2000 Data

The updated Census 2000 population figures confirm the conclusions regarding the benefits of the Preferred Alternative over the No Action Alternative. The proposed unidirectional Runway 14/32, which reduces delays and provides added flexibility to improve PRAS conformance, results in fewer people exposed to the highest DNL levels above both 70 and 75 dB. This is true both for the 29M Low and the 37.5M High fleets, as shown in Table 3.6-1.

3.6.2.1 Total Noise Affected Population

Under the 29M Low fleet, there is a net reduction of 398 people exposed to DNL values above 65 dB if the Preferred Alternative is implemented. This compares favorably to the 1990 Census analysis that indicated an increase of 378 people above DNL 65. The 2000 Census also shows a smaller increase in impact from the Preferred Alternative under the 37.5M High fleet than was shown to occur with the 1990 Census. The Preferred Alternative only adds 253 people to the 65 dB DNL contour based on the 2000 Census, compared to 508 using the 1990 Census. Both censuses indicate that the noise benefits at higher noise levels are accompanied by net increases in the numbers of people exposed to lower DNL levels of 60 and 65 dB, though the Census 2000 data indicate more people are living in these lower exposure areas than were living there in 1990.

Table 3.6-1
Summary of Total Population Impacts – Comparison of Preferred Alternative and No Action Using 1990 and 2000 Census Data

Fleet Scenario/ DNL Level	1990 Census No Action	1990 Census Preferred Alternative	1990 Census Change	2000 Census No Action	2000 Census Preferred Alternative	2000 Census Change
29M Low						
Above 75 dB	257	77	-180	122	2	-120
Above 70 dB	1,521	1,459	-62	1,612	1,381	-231
Above 65 dB	17,531	17,909	378	18,960	18,562	-398
Above 60 dB	59,523	60,418	895	68,171	71,080	2,909
37.5 High						
Above 75 dB	257	58	-199	187	0	-187
Above 70 dB	3,828	1,028	-2,800	3,733	968	-2,765
Above 65 dB	11,499	12,007	508	12,423	12,676	253
Above 60 dB	41,659	52,153	10,494	47,615	59,737	12,122

3.6.2.2 Noise Affected Populations by Community

Based on the 2000 Census data, fewer residents of East Boston, Revere and Winthrop fall within the 75 dB and 70 dB DNL contours as a result of the Preferred Alternative. As shown in Table 3.6-2, under the 29M Low fleet scenario, there are 231 fewer residents of these communities in the 70 dB DNL based on the Census 2000. For the 37.5M High fleet scenario, the Preferred Alternative results in 2,765 fewer residents of these communities exposed to noise of 70 dB DNL or greater (Table 3.6-3). These results are consistent with the analysis presented in the Draft EIS/EIR and the Supplemental DEIS/FEIR, which was based on population data from the 1990 Census. Changes in noise-exposed populations for all fleets and all alternatives, by community, are shown in Appendix H.

Table 3.6-2
29M Low Population Impacts by Community – Preferred Alternative vs. No Action
Using 1990 and 2000 Census Data

Community	DNL	1990 Census			2000 Census		
		No Action	Preferred Alternative	Change	No Action	Preferred Alternative	Change
Boston (Other)	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	0	0	0
	60 dB and above	0	0	0	136	1,565	1,429
Chelsea	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	3,056	3,300	244	2,901	3,302	401
	60 dB and above	10,232	10,370	138	12,047	12,047	0
East Boston	75 dB and above	58	0	-58	0	0	0
	70 dB and above	437	398	-39	592	499	-93
	65 dB and above	7,117	7,256	139	8,822	8,200	-622
	60 dB and above	26,035	26,160	125	30,157	30,772	615
Everett	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	0	0	0
	60 dB and above	220	340	120	319	1,956	1,637
Long Island	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	0	0	0
	60 dB and above	0	502	502	0	0	0
Quincy	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	0	0	0
	60 dB and above	0	0	0	610	610	0
Revere	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	3,001	2,999	-2	3,074	2,994	-80
	60 dB and above	5,227	5,115	-112	6,147	5,890	-257
South Boston	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	66	98	32	0	61	61
	60 dB and above	6,010	6,603	593	7,358	7,110	-248
Winthrop	75 dB and above	199	77	-122	122	2	-120
	70 dB and above	1,084	1,061	-23	1,020	882	-138
	65 dB and above	4,291	4,256	-35	4,163	4,005	-158
	60 dB and above	11,799	11,328	-471	11,397	11,130	-267
Total	75 dB and above	257	77	-180	122	2	-120
	70 dB and above	1,521	1,459	-62	1,612	1,381	-231
	65 dB and above	17,531	17,909	378	18,960	18,562	-398
	60 dB and above	59,523	60,418	895	68,171	71,080	2,909

Table 3.6-3
37.5M High Population Impacts by Community – Preferred Alternative vs. No Action Using 1990 and 2000 Census Data

Community	DNL	1990 Census			2000 Census		
		No Action	Preferred Alternative	Change	No Action	Preferred Alternative	Change
Boston (Other)	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	0	0	0
	60 dB and above	674	432	-242	753	1,961	1,208
Chelsea	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	1,415	1,415	0	814	814
	60 dB and above	3,095	8,488	5,393	3,302	9,739	6,437
East Boston	75 dB and above	58	58	0	65	0	-65
	70 dB and above	355	157	-198	352	260	-92
	65 dB and above	3,006	4,247	1,241	3,180	5,717	2,537
	60 dB and above	14,126	21,000	6,212	18,049	24,113	7,317
Everett	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	0	0	0
	60 dB and above	0	0	0	0	36	36
Long Island	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	0	0	0
	60 dB and above	0	502	502	0	0	0
Quincy	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	0	0	0	610	0	-610
	60 dB and above	0	0	0	636	610	-26
Revere	75 dB and above	0	0	0	0	0	0
	70 dB and above	2,260	172	-2,088	2,234	169	-2,065
	65 dB and above	3,799	3,293	-506	4,127	3,379	-748
	60 dB and above	8,472	5,658	-2,814	10,158	6,526	-3,632
South Boston	75 dB and above	0	0	0	0	0	0
	70 dB and above	0	0	0	0	0	0
	65 dB and above	55	48	-7	34	0	-34
	60 dB and above	3,094	6,002	2,908	3,340	7,092	3,752
Winthrop	75 dB and above	199	0	-199	122	0	-122
	70 dB and above	1,213	699	-514	1,147	539	-608
	65 dB and above	4,639	3,004	-1,635	4,472	2,766	-1,706
	60 dB and above	11,536	10,071	-1,465	11,377	9,660	-1,717
Total	75 dB and above	257	58	-199	187	0	-187
	70 dB and above	3,828	1,028	-2,800	3,733	968	-2,765
	65 dB and above	11,499	12,007	508	12,423	12,676	253
	60 dB and above	41,659	52,153	10,494	47,615	59,737	12,122

Of particular interest are the differences in noise-exposed populations in Chelsea where sound insulation is proposed to mitigate the noise impacts of the Preferred Alternative[14]. Table 3.6-4 shows the population counts for Chelsea using data from the 1990 and the 2000 Censuses. Under the 29M Low fleet, an additional 157 people in Chelsea are added to the 65 dB DNL contour by the Preferred Alternative using the 2000 Census as opposed to the 1990 Census. Under the 37.5M High fleet assumptions, the number of people in the Preferred Alternative 65 DNL decreases by 601 using the 2000 Census.

Table 3.6-4
Chelsea Population Impacts – Preferred Alternative vs. No Action, Using 1990 and 2000 Census Data

Fleet Scenario/	1990 Census			2000 Census		
DNL Level	No Action	Preferred Alternative	Change	No Action	Preferred Alternative	Change
29M Low						
Above 75 dB	0	0	0	0	0	0
Above 70 dB	0	0	0	0	0	0
Above 65 dB	3,056	3,300	244	2,901	3,302	401
Above 60 dB	10,232	10,370	138	12,047	12,047	0
37.5 High						
Above 75 dB	0	0	0	0	0	0
Above 70 dB	0	0	0	0	0	0
Above 65 dB	0	1,415	1,415	0	814	814
Above 60 dB	3,095	8,488	5,393	3,302	9,739	6,437

An examination of the differences that occur in Chelsea as a result of the Census 2000 data illustrates the changes due to demographic growth versus changes due to refinement of the census coordinate system. Under the 37.5M High scenario, six centroids in Chelsea having a 1990 population of 796 were included in the 65 dB DNL contour. However, with the shift in coordinate systems from 1990 to 2000, these six centroids now fall within the 60 to 65 dB contour (Table 3.6-5). According to the 2000 Census, those six centroids have a year 2000 population of 837 people, or 41 more than in 1990. The balance of the centroids that were in the 65 dB DNL contour in 1990 and remain there in the 2000 Census, had a 1990 population of 619 and a year 2000 population of 811, a net increase of 192 people. The remaining 3 people that are shown to be in the 65 dB DNL contour according to the 2000 Census result from the addition of two centroids that shifted location under the updated coordinate system, moving them from the 60 to 65 dB exposure increment in 1990 to the 65 to 70 dB increment under the 2000 Census.

14 The 65 dB DNL contour for the 29M Low fleet will be used to determine eligibility for sound insulation. See Chapter 4, Mitigation.

Table 3.6-5
Examination of Changes in Census Geography in Chelsea – 37.5M High Preferred Alternative 65 dB DNL Populations Using 1990 and 2000 Censuses

Above 65 dB DNL	1990 Census Population	2000 Census Population	Change	Reason
Six Chelsea Centroids	796	--	-796	[1]
Newly Added Chelsea Centroids	N/A	3	3	[2]
All Other Chelsea Centroids	619	811	192	[3]
Total Population Above 65	1,415	814	-601	

1 Six centroids were shifted from the 65 dB DNL contour to the 60 dB DNL contour as a result of the update to the census coordinate system.
2 Two centroids with a 2000 population of 3 were shifted from the 60 dB DNL contour to the 65 dB DNL contour as a result of the update to the census coordinate system.
3 Population growth from 1990 to 2000.

In summary, the majority of the observed changes in noise-exposed populations in Chelsea occurs not because of people moving out of Chelsea but because of changes in centroid locations due to the U.S. Census Bureau's upgraded coordinate system.

3.6.2.3 Conclusion of Noise Impacts

The major conclusions drawn from the Census 2000 analysis are comparable to those presented in the Draft EIS/EIR and the Supplemental DEIS/FEIR, which relied on 1990 Census data are:

- Runway 14/32 reduces the population most severely affected by airport noise that fall within the 70 and 75 dB DNL noise contours, regardless of the fleet forecast. The communities benefiting most from these reduced exposure levels are Winthrop and East Boston. Revere also benefits from reduced exposure under the 37.5M High fleet. No community is expected to experience an increase in exposure to DNL levels above 70 or 75 dB.

- Under the 29M Low fleet, the Preferred Alternative also reduces the number of people within the 65 dB DNL contour. However, within this group of communities, some will experience increased noise and some will experience decreases.

- While the greater reliance on the use of Runways 15R/33L and 14/32 under the Preferred Alternative reduces the population within the 70 and 75 dB DNL contours for all future fleets, the total noise exposed population within the 65 dB contour increases for the 37.5M High fleet and decreases for the 29M Low fleet. The communities with population increases in the 65 dB DNL resulting from the Preferred Alternative include Chelsea and East Boston, primarily in the vicinity of Eagle Hill.

3.6.3 Updated Environmental Justice Analysis Using Census 2000 Data

The Environmental Justice analysis presented in this section of this Final EIS builds upon the analysis presented in Section 6.5 of the Supplemental DEIS/FEIR, which is incorporated by reference. It presents an update of the Environmental Justice analysis of the noise-affected population for the 29M Low Fleet scenario for the Preferred Alternative and the No Action Alternative of the Airside Project using available Census 2000 data. The U.S. Census Bureau has released 2000 block-level data on total population, race and ethnic origin, which allows for an analysis of the minority population affected.[15] Data on income are not available at the current time, and therefore an updated analysis of the low-income population affected was not performed. [16]

This section presents a summary of demographic characteristics for the communities affected by the 65 and 60 dB DNL noise contours, and the estimated 2000 total and minority population within the 65 and 60 dB DBL noise contours for the 29M Low Fleet for the Preferred and No Action Alternatives. This analysis found no high and adverse disproportionate impact caused by the Preferred Alternative.

3.6.3.1 Introduction

The analysis of project impacts on minority and low-income communities that was presented in the Supplemental DEIS/FEIR was conducted in accordance with federal Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations; the National Environmental Policy Act (NEPA); and U. S. Department of Transportation (U.S. DOT) Order to Address Environmental Justice in Minority Populations and Low-Income Populations (Final U.S. DOT Order).[17] The Census 2000 update that follows is consistent with the same federal requirements.

Executive Order 12898, issued in 1994, requires "each Federal agency [to] make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations...." The U.S. DOT published the Final U.S. DOT Order in 1997,[18] setting forth a process by which U.S. DOT and its operating administrations will integrate the goals of EO 12898 with its existing regulations and guidance. The Final U.S. DOT Order defines key terms, and provides guidance for identifying and addressing disproportionately high and adverse impacts to low-income and minority populations. Additional guidance for implementing EO 12898 within the context of the NEPA process is provided by the Council on Environmental Quality (CEQ) in *Environmental Justice Guidance under the National Environmental Policy Act*.[19]

15 2000 U.S. Census data on total population, race and ethnic origin for Massachusetts was released on March 21, 2001.
16 2000 U.S. Census data on income is expected to be released on a state by state basis between June and September of 2002.
17 U.S. DOT, April 15, 1997, Final U.S. DOT Order, *Federal Register*, Volume 62, No. 72.
18 Ibid.
19 *Environmental Justice: Guidance Under the National Environmental Policy Act*, Council on Environmental Quality, 1997.

3.6.3.2 Methodology

The analysis of impacts conducted for the Supplemental DEIS/FEIR identified noise as the only off-site environmental impact associated with the Preferred Alternative with the potential to cause disproportionately high and adverse health or environmental effects on minority and/or low-income populations. The environmental justice analysis that was conducted for the Supplemental DEIS/FEIR therefore assessed the potential for disproportionately high and adverse noise impacts to low-income and minority populations. This Final EIS presents an updated analysis using available 2000 U.S. Census data following the same methodology.

The data presented are based on 2000 U.S. Census data using Geographic Information System (GIS) technology to analyze impacts at a Census Block level where the data are available. The "Block" represents the most detailed level of census data.

The minority and low-income populations within the 65 dB DNL contour as delineated by the Airside Project noise impact assessment (see Section 6.2 of the Supplemental DEIS/FEIR) were identified for the No Action Alternative and Preferred Alternative for the 29M Low Fleet scenario, which represents the highest noise impact scenario. The 65 dB DNL contour is the threshold established by FAA for significant adverse noise impacts in residential areas. A similar analysis was developed for the population within the 60 dB DNL noise contour in keeping with the Massachusetts Secretary of Environmental Affairs' Certificate on the Draft EIR.

3.6.3.3 Definitions

Minority Population

A minority person is defined as an individual who is a member of one of the following population groups: Black (not of Hispanic origin), Hispanic, Asian, and American Indian or Native Alaskan. According to the Final U.S. DOT Order, a minority population means any readily identifiable groups of minority persons that live in geographic proximity. CEQ Guidance regulations state that minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. Information on race and Hispanic origin was analyzed at the Block Level utilizing the 2000 U.S. Census, which is the most detailed level of population data made available by the U.S. Bureau of Census.

Low Income

The Final U.S. DOT Order defines low-income persons as those whose "median household income is below the United States Department of Health and Human Services poverty guidelines." CEQ Guidelines state that low-income populations should be identified with the annual statistical poverty thresholds developed by the Bureau of the Census. The Logan Airside Improvements Planning Project used the 1990 U.S. Census as the database for demographic analyses. Comparable data for 2000 will not be available until 2002, and therefore this assessment was not updated for this Final EIS.

The population was considered to be a low-income population if the median household income was at or below $10,560. This represents the 1990 federal poverty level for a three-person household as defined by the U.S. Department of Health and Human Services.[20] In order to provide additional analysis of a broader range of incomes, the environmental justice analysis was also conducted using a median household income of 150 percent ($15,840) of the poverty level for a family of three. Information on income was analyzed at a Block Group level, the most detailed level of information available from the 1990 Census regarding income.

3.6.3.4 Disproportionately High and Adverse Impacts

Adverse impacts to low-income and/or minority populations are considered "high and disproportionate" if: (a) the adverse impact is predominantly borne by a minority population and/or a low-income population, or (b) the adverse impact that will be suffered by the minority population and/or low-income population is more severe or greater in magnitude than the adverse impact that will be suffered by the non-minority population and/or non-low-income population. The Final U.S. DOT Order directs FAA to determine disproportionate impact, taking into account mitigation, enhancement measures and all off-setting benefits to the affected populations, as well as the design, comparative impacts and the relevant number of similar existing system elements in non-minority and non-low income areas.

3.6.3.5 Baseline Demographic Characteristics

A determination of " disproportionately high and adverse impacts" to a low-income or minority population is based on a comparison of the impacts on these populations to the impacts experienced by the affected populations a whole. The Area of Potential Effect for the Logan Airside Improvements Planning Project was identified as those political jurisdictions (cities and towns) affected by the 65 dB DNL contour, which is consistent with the definition of adverse noise impact contained in Federal Aviation Regulation (FAR) Part 150. The potentially affected area for noise impacts was chosen to delineate the study area because noise is the most geographically widespread impact. The population within the 60 dB DNL noise contour was also analyzed to be consistent with the analysis contained within the Supplemental DEIS/FEIR.

The political jurisdictions affected by the 65 dB DNL noise contour include Boston, Chelsea, Revere, and Winthrop, which collectively comprise Suffolk County. The demographic characteristics of these communities provide the baseline against which to compare the demographic characteristics of the population within the 65 dB DNL contour. This comparison allows for an assessment of whether the noise impacts associated with the 65 dB DNL contour disproportionately affects minority and low income populations compared to the demographic characteristics of the baseline communities.

The political jurisdictions affected by the 60 dB DNL contour include Boston, Chelsea, Revere, Winthrop, Everett, and Quincy. The City of Quincy is now included within the baseline communities because the 60 dB DNL contour extends over the area of the Marina

20 The 1999 poverty level for a family of three as report by the U.S. Department of Health and Services is $13,880.

Bay development, which was developed subsequent to 1990. The population counts for the 60 dB DNL contour based on 1990 Census data do not include any population in Quincy.

The following sections present information on the total population and minority population for the study area communities and discuss the changes that have occurred between 1990 and 2000.

3.6.3.6 Total Population

The total 2000 population of the communities affected by the 65 dB DNL noise contour (Boston, Chelsea, Revere, and Winthrop, which collectively compose Suffolk County) was 689,807, which represents approximately a 4 percent increase over the 1990 population of 663,906. Chelsea population grew at rate of 22 percent, followed by Revere at 11 percent, Boston at 3 percent, and Winthrop at 1 percent. It should be noted that while the City of Boston as a whole grew by only 3 percent, the population of East Boston itself increased by 17 percent since 1990. The population of South Boston grew by only 2 percent during the same time period.

The communities affected by the 60 dB DNL noise contour include Boston, Chelsea, Winthrop, Revere, Everett, and Quincy. Total population for the communities potentially affected by the 60 dB DNL has increased from 784,594 in 1990 to 815,869 in 2000, a 4 percent increase.[21] Population within the City of Everett increased by 7 percent, while population within the City of Quincy has increased by 4 percent.

3.6.3.7 Minority Population

The minority population within all communities adjacent to Logan Airport has increased since 1990, while the white population has uniformly decreased. The 2000 minority population within Boston, Chelsea, Revere, and Winthrop (65 dB DNL communities) was 330,272, which represents 48 percent of the total population. (See Table 3.6-6) In 1990, the minority population accounted for 38 percent of the total population of the four communities.

2000 minority population within the communities affected by 60dB DNL was 339,722, or 47 percent of the total population. In 1990, the minority population accounted for 36 percent of the total population of the five communities. (See Table 3.6-7 for more information.)

The minority population of some of the communities adjacent to Logan Airport has increased dramatically. The 2000 minority population in Chelsea was 62 percent of the total population, up from 40 percent in 1990. The Hispanic/Latino population represented 48 percent of the total population in Chelsea in 2000.

21 The City of Quincy was not included in the 1990 baseline population totals (699,607) for the communities affected by the 60 dB DNL contour presented in Table 6.8-4 of the Supplemental DEIS/FEIR. The 1990 baseline total population for the communities affected by the 60 dB DNL contour presented in this Final EIS includes the 1990 Quincy population (84,985) in the total to allow for a consistent comparison with the 2000 60 dB DNL baseline communities.

Table 3.6-6
Minority Population of Political Jurisdictions within the 65dB DNL Noise Contour

						Minority Ethnicity Groups											
		White[1]		Minority[2]		*Black/ African American[3]*		*Hispanic/Latino*		*Asian/Pacific Islander[4]*		*Native American[5]*		*Other*		*Multi-Racial[7]*	
Jurisdiction	Total Population	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.
Boston	589,141	291,561	49.5%	297,580	50.5%	140,305	24%	85,089	14%	44,280	8%	1,517	0.26%	8,215	1%	18,174	3%
East Boston[8]	38,413	19,078	49.7%	19,335	50.3%	1,177	3%	14,990	39%	1,553	4%	71	0.18%	440	1%	1,104	3%
South Boston[8]	29,965	25,327	84.5%	4,638	15.5%	741	2%	2,244	7%	1,166	4%	79	0.26%	41	0%	367	1%
Chelsea	35,080	13,424	38.3%	21,656	61.7%	1,971	6%	16,984	48%	1,626	5%	76	0.22%	195	1%	804	2%
Revere	47,283	37,530	79.4%	9,753	20.6%	1,248	3%	4,465	9%	2,165	5%	88	0.19%	297	1%	1,490	3%
Winthrop	18,303	17,020	93.0%	1,283	7.0%	293	2%	493	3%	213	1%	29	0.16%	73	0%	182	1%
Suffolk County	689,807	359,535	52.1%	330,272	47.9%	143,817	21%	107,031	16%	48,284	7%	1,710	0.25%	8,780	1%	20,650	3%
Massachusetts	6,349,097	5,198,359	82%	1,579,467	24.9%	318,329	5%	428,729	7%	238,492	4%	11,264	0.18%	43,586	1%	539,067	8%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data
1 Includes all persons who indicated their race as White, not of Hispanic origin.
2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.
3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.
4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.
5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.
6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.
7 Includes all persons who indicated to having two or more races, not of Hispanic origin.
8 Neighborhoods within the City of Boston as defined by the Boston Redevelopment Authority (BRA). They are provided for informational purposes. Population included within the City of Boston.

Table 3.6-7
Minority Population of Political Jurisdictions within the 60dB DNL Noise Contour

						Minority Ethnicity Groups											
		White[1]		Minority[2]		*Black/ African American[3]*		*Hispanic/Latino*		*Asian/Pacific Islander[4]*		*Native American[5]*		*Other*		*Multi-Racial[7]*	
Jurisdiction	Total Population	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.	Persons	Pct.
Suffolk County	689,807	359,535	52.1%	330,272	47.9%	143,817	21%	107,031	16%	48,284	7%	1,710	0.25%	8,780	1%	20,650	3%
Everett	38,037	28,587	75%	9,450	24.8%	2,269	6%	3,617	10%	1,251	3%	100	0.26%	559	1%	1,654	4%
Quincy City	88,025	68,980	78.4%	19,045	21.6%	1,846	2.1%	1,835	2.1%	13,538	15.4%	129	0.1%	290	0.3%	1,407	1.6%
Total	815,869	457,102	56%	358,767	44.0%	147,932	18%	112,483	14%	63,073	8%	1,939	0.24%	9,629	1%	23,711	3%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data
1 Includes all persons who indicated their race as White, not of Hispanic origin.
2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.
3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.
4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.
5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.
6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.
7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

THIS PAGE INTENTIONALLY LEFT BLANK

The minority population of East Boston in 2000 was 50 percent of the total population. In 1990, the minority population of East Boston was only 24 percent of the total population. The Hispanic/Latino population is the largest minority group in East Boston and represented 39 percent of the total population in 2000.

The minority population in South Boston grew from 4 percent in 1990 to 16 percent in 2000; in Revere from 9 percent to 21 percent; in Everett from 10 percent to 25 percent, and in Quincy from 9 percent to 22 percent. Winthrop is the only community adjacent to Logan Airport that does not have a significant minority population. In 2000, the minority population in Winthrop was 7 percent of the total population, up from 3 percent in 1990.

3.6.3.8 Noise Impacts To The Census 2000 Populations

The following sections discuss the 2000 total and minority populations affected by noise within the 65 and 60 dB DNL contour for the 29M Low Fleet Scenario for the Preferred Alternative.

3.6.3.9 Total Noise Affected Population within the 65 dB DNL Contour

The overall population within the 65 dB DNL noise contour for the No Action Alternative increased from 17, 531 (1990 Census) to 18,960 (2000 Census). While the overall population within the 65 dB DNL noise contour for the Preferred Alternative increased from 17,909 (1990 Census) to 18,562 (2000 Census), it represents a reduction in the noise-affected population when compared to the No Action Alternative. (See Tables 3.6-8 and 3.6-9) The 2000 Census data shows a slight net reduction (2 percent) in the noise-affected population within 65 dB DNL totaling 398 people as a result of the Preferred Alternative; while the 1990 Census data showed a slight increase (2 percent - 378 people) in the noise-affected population within 65 dB DNL. (See Tables 3.6-10 and 3.6-11 for a comparison of the 1990 and 2000 data.)

Table 3.6-8
Estimated Population within the 65 dB Contour (Census 2000) for the No Action Alternative of the 29 Million Low Fleet Scenario

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	2,901	917	1,984	105	1,753	57	7	12	50
Dorchester	0	0	0	0	0	0	0	0	0
East Boston	8,822	5,160	3,662	106	2,959	264	11	35	287
Everett	0	0	0	0	0	0	0	0	0
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	0	0	0	0	0	0	0	0	0
Revere	3,074	2,437	637	89	370	67	7	28	76
Roxbury	0	0	0	0	0	0	0	0	0
South Boston	0	0	0	0	0	0	0	0	0
South End	0	0	0	0	0	0	0	0	0
Winthrop	4,163	3,988	175	29	71	35	4	4	32
Total	18,960	12,502	6,458	329	5,153	423	29	79	445
% of Total		66%	34%	2%	27%	2%	0%	0%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

Table 3.6-9
Estimated Population within the 65 dB Contour (Census 2000) for the Preferred Alternative of the 29 Million Low Fleet Scenario

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	3,302	1,002	2,300	120	2,032	68	7	22	51
Dorchester	0	0	0	0	0	0	0	0	0
East Boston	8,200	4,930	3,270	100	2,671	214	10	33	242
Everett	0	0	0	0	0	0	0	0	0
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	0	0	0	0	0	0	0	0	0
Revere	2,994	2,372	622	88	363	66	7	28	70
Roxbury	0	0	0	0	0	0	0	0	0
South Boston	61	59	2	0	1	1	0	0	0
South End	0	0	0	0	0	0	0	0	0
Winthrop	4,005	3,859	146	24	58	36	1	2	25
Total	18,562	12,222	6,340	332	5,125	385	25	85	388
% of Total		66%	34%	2%	28%	2%	0%	0%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

Table 3.6-10
Comparison of the 1990-2000 Estimated Population within the 65 dB Contour for the No-Action Alternative of the 29 Million Low Fleet Scenario

	Total Population 1990	Total Population 2000	Non-Hispanic White[1] 1990	Non-Hispanic White[1] 2000	Minority[2] 1990	Minority[2] 2000
Back Bay	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0
Chelsea	3,056	2,901	1,154	917	1,902	1,984
Dorchester	0	0	0	0	0	0
East Boston	7,117	8,822	5,756	5,160	1361	3,662
Everett	0	0	0	0	0	0
Jamaica Plain	0	0	0	0	0	0
Long Island	0	0	0	0	0	0
Quincy	0	0	0	0	0	0
Revere	3,001	3,074	2,736	2,437	265	637
Roxbury	0	0	0	0	0	0
South Boston	66	0	49	0	17	0
South End	0	0	0	0	0	0
Winthrop	4,291	4,163	4,231	3,988	60	175
Total	17,531	18,960	13,926	12,502	3,605	6,458
% of Total			79.4%	66%	20.6%	34%

Source: U.S. Census Bureau
1 Includes all persons who indicated their race as White, not of Hispanic origin.
2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

Table 3.6-11
Comparison of the 1990-2000 Estimated Population within the 65 dB Contour for the Preferred Alternative of the 29 Million Low Fleet Scenario

	Total Population 1990	Total Population 2000	Non-Hispanic White[1] 1990	Non-Hispanic White[1] 2000	Minority[2] 1990	Minority[2] 2000
Back Bay	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0
Chelsea	3,300	3,302	1,171	1,002	2,129	2,300
Dorchester	0	0	0	0	0	0
East Boston	7,256	8,200	5,890	4,930	1366	3,270
Everett	0	0	0	0	0	0
Jamaica Plain	0	0	0	0	0	0
Long Island	0	0	0	0	0	0
Quincy	0	0	0	0	0	0
Revere	2,999	2,994	2,734	2,372	265	622
Roxbury	0	0	0	0	0	0
South Boston	98	61	80	59	18	2
South End	0	0	0	0	0	0
Winthrop	4,256	4,005	4,200	3,859	56	146
Total	17,909	18,562	14,075	12,222	3,834	6,340
% of Total			78.6%	66%	21.4%	34%

Source: U.S. Census Bureau
1 Includes all persons who indicated their race as White, not of Hispanic origin.
2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

Noise-affected populations within 65 dB DNL in East Boston, Revere, and Winthrop are reduced under the Preferred Alternative using the 2000 Census data**,** with the largest reduction (622 people or 7 percent) in East Boston. The 1990 data showed the opposite trend for East Boston with a slight increase in population. The trend for Revere and Winthrop are consistent for the 1990 and 2000 data. The reasons for the difference in the 2000 population are: 1) the result of the shifting of the centroid of the census blocks along the edge of the contour, 2) the introduction of three new census blocks (1001, 2001, 2002) in the area of White and Border Streets near the High School, and 3) the fact that the Preferred Alternative contour now misses one point (Tract 511, Block 1009) in the Bayswater Street area.

The noise-affected population within 65 dB DNL in Chelsea increased for both the 1990 and 2000 data with similar numbers of people affected (3300 in 1990, 3302 in 2000). The noise-affected population in South Boston also shows a slight increase for the 1990 and

2000 data; the only difference being that the No Action Alternative for the 2000 data does not show any people within the 65 dB DNL noise contour.

3.6.3.10 Noise Affected Minority Population within the 65 dB DNL Contour

Approximately 34 percent of the 2000 Census population that are affected by the 65 dB DNL No Action noise contour are minority. The same percentage of the population affected by the 65dB DNL Preferred Alternative noise contour is minority (34 percent). While this is a higher percentage than the minority population affected using the 1990 Census (21 percent), the conclusion that there is no difference in the percentage of minority population affected by the No Action and Preferred Alternatives remains the same. The 2000 Census minority population affected by the 65 dB DNL noise contour for the Preferred Alternative (34 percent) is less than the 2000 baseline minority population of Boston, Chelsea, Revere and Winthrop (48 percent). Therefore, the conclusion that there are no disproportionate impacts to the minority population remains valid.

In addition, the 2000 data shows an overall reduction in the noise-affected population within the 65 dB DNL contour, as well as a reduction in the minority population. The total 2000 minority population within the 65 dB DNL contour for the Preferred Alternative (6,340) is 118 people less than the total minority population within the No Action Alternative 65 dB DNL contour (6,458). This was not the case with the 1990 population, where the total minority population within the 65 dB DNL contour for the Preferred Alternative (3,834) was more than the total minority population within the No Action Alternative 65 dB DNL contour (3,605).

See Figure 3.6-1 for a graphic representation of the minority population within the communities adjacent to Logan Airport.

3.6.3.11 Total Noise Affected Population within the 60 dB DNL Contour

The overall population within the 60 dB DNL noise contour for the No Action Alternative increased from 59,523 (1990 Census) to 68,171 (2000 Census). The overall population within the 60 dB DNL noise contour for the Preferred Alternative also increased, from 60,418 (1990 Census) to 71,080 (2000 Census). (See Tables 3.6-12 and 3.6-13) The net change in noise-affected population within the 60 dB DNL between the No Action and Preferred Alternative for the 1990 data represents a 1.5 percent increase in the noise-affected population when compared to the No Action Alternative. The net change in noise-affected population within the 60 dB DNL between the No Action and Preferred Alternative for the 2000 data represents a 4.3 percent increase in the noise-affected population when compared to the No Action Alternative. (See Tables 3.6-14 and 3.6-15 for a comparison of the 1990 and 2000 data.)

Communities with noise-affected populations within the No Action 60 dB DNL for the 2000 Census data include Chelsea, Boston (East Boston and South Boston), Everett, Revere, and Winthrop. These same communities are also included in the No Action 60 dB DNL contour for the 1990 Census data. However, the No Action 60 dB DNL 2000

population counts also include 136 people in Dorchester and 610 people in Quincy; while the No Action 60 dB DNL 1990 population counts do not include any people within Dorchester and Quincy. In the case of the Dorchester population, the 2000 Census block centroid moves slightly, thereby bringing the population within the 60 dB DNL contour. The increase in population in Quincy reflects the development of the Marina Bay condominiums since 1990. Previously the area included a larger block with a different centroid coordinate. The development of Marina Bay and subsequent increase in population resulted in a modification of the census block and a new centroid that is now within the 60 dB DNL noise contour.

The communities with noise-affected populations within the Preferred Alternative 60 dB DNL contour for the 2000 Census data include Chelsea, East Boston, Everett, Revere, South Boston, and Winthrop—the same communities included in the Preferred Alternative 60 dB DNL contour for the 1990 Census data. The Preferred Alternative 60 dB DNL 2000 population counts do not include the 136 people in Dorchester that were included in the No Action 2000 population. Therefore the 2000 and 1990 Preferred Alternative 60 dB DNL population counts for Dorchester are the same—0 people. The Preferred Alternative 60 dB DNL 2000 population counts include the 610 people in Quincy included in the 2000 No-Action population counts. The 1990 Preferred Alternative 60 dB DNL 1990 population counts do not include any people within Quincy.

In addition, the Preferred Alternative 60 dB DNL 2000 population counts include 1,565 people in Roxbury. The 1990 population counts did not indicate any population in Roxbury affected by the Preferred Alternative 60 dB DNL contour. There are two population centroids from the 2000 Census data that are within the Preferred Alternative 60 dB DNL contour that were not included in the 1990 population counts.

One of the two points (with 2000 population of 1,549) had zero population in 1990. This point (Tract 801, Block 1000) is the location of the new Suffolk County House of Correction at South Bay, which had not been constructed in 1990. The population of this census block is predominately (78 percent) minority. (Please note that the U.S. Census classifies this block as being in Roxbury. The Boston Redevelopment Authority (BRA) classifies this block as being in North Dorchester.)

The second centroid point (Tract 801, Block 1028), which had a 2000 population of 16 people and a 1990 population of 14 people, moved slightly since 1990 and has new latitude and longitude coordinates. The DNL value at the 1990 centroid location was 59.9 dB while the DNL value at the 2000 centroid location is 60.0 dB. The noise did not change; the centroid of population moved closer to the contour. Block 1028 is also predominately (81 percent) minority, and is also classified by the BRA as being in North Dorchester.

The 2000 population counts also do not include any population on Long Island within the Preferred Alternative 60 dB DNL contour, while the 1990 population counts for the same condition include 502 people. This difference is the result of the movement of the centroid of the census block to the south and out of the 60 dB DNL noise contour.

Table 3.6-12
Estimated Population within the 60 dB Contour (Census 2000) for the No Action Alternative of the 29 Million Low Fleet Scenario

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	12,047	3,828	8,219	436	7,125	331	36	62	229
Dorchester	136	111	25	14	1	10	0	0	0
East Boston	30,157	16,097	14,060	577	11,089	1,139	50	311	894
Everett	319	247	72	32	15	9	-	2	14
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	610	544	66	9	10	33	1	2	11
Revere	6,147	4,872	1,275	133	735	187	10	41	169
Roxbury	0	0	0	0	0	0	0	0	0
South Boston	7,358	6,065	1,293	174	591	342	35	9	142
South End	0	0	0	0	0	0	0	0	0
Winthrop	11,397	10,839	558	85	233	110	18	19	93
Total	68,171	42,603	25,568	1,460	19,799	2,161	150	446	1,552
% of Total		62%	38%	2%	29%	3%	0%	1%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

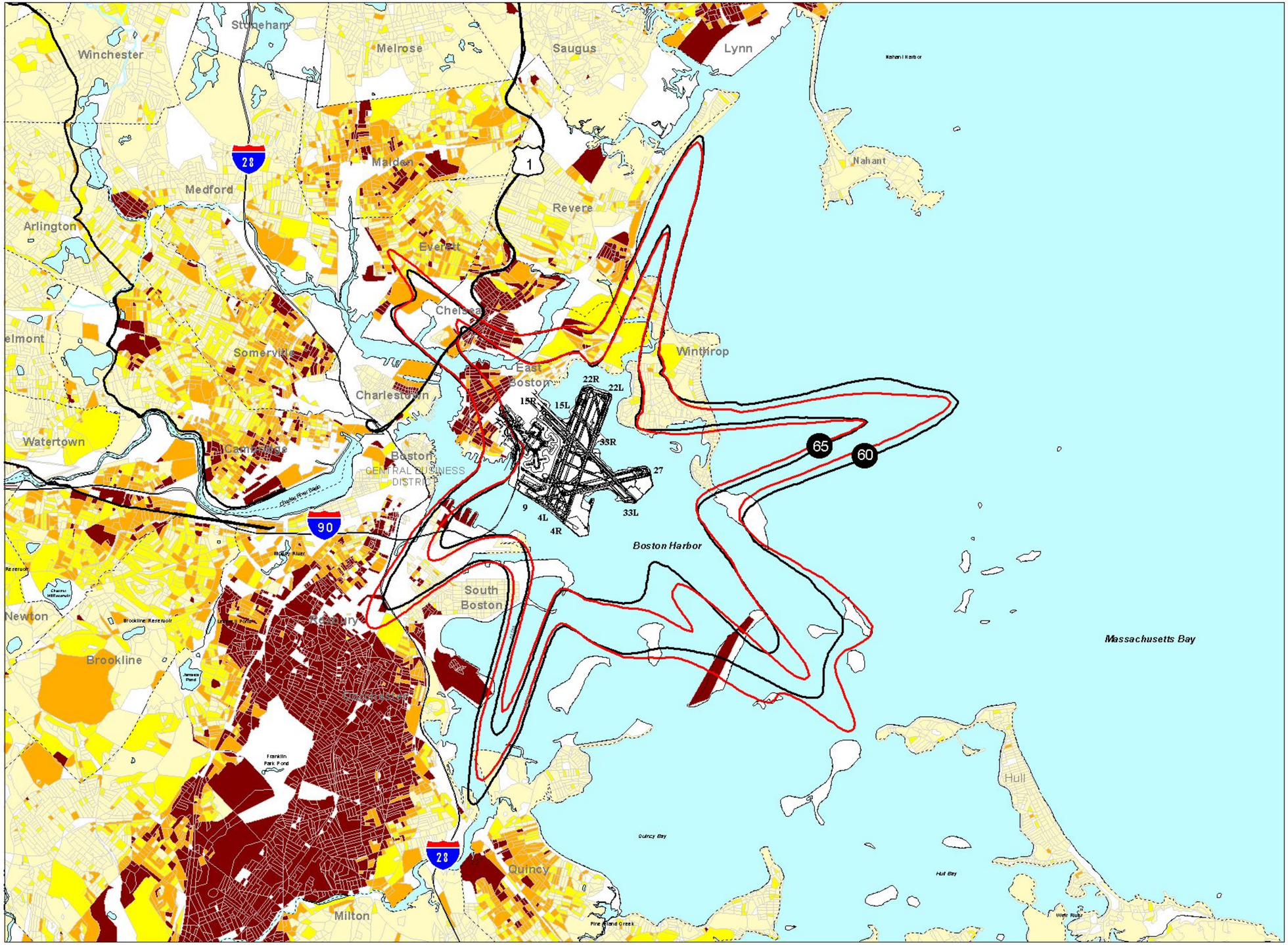
3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.



Legend

No Action Alternative 29M Low
60 and 65 DNL

Preferred Alternative 29M Low
60 and 65 DNL

Minority Population by Census Block
- Greater Than 49.9% Minority
- 25 % - 49 % Minority
- 15 % - 24.9 % Minority
- Less Than 15 % Minority
- Unpopulated (<10 Persons)

N

0 0.5 1 1.5 Miles

Figure 3.6-1

Percent Minority Population by 2000 Census Block

Source: DMJM+HARRIS

THIS PAGE INTENTIONALLY LEFT BLANK

Table 3.6-13
Estimated Population within the 60 dB Contour (Census 2000) for the Preferred Alternative of the 29 Million Low Fleet Scenario

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	12,047	3,828	8,219	436	7,125	331	36	62	229
Dorchester	0	0	0	0	0	0	0	0	0
East Boston	30,772	16,557	14,215	580	11,216	1,140	50	316	913
Everett	1,956	1,441	515	129	186	87	4	30	79
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	610	544	66	9	10	33	1	2	11
Revere	5,890	4,703	1,187	128	707	163	10	40	139
Roxbury	1,565	344	1,221	822	321	21	9	4	44
South Boston	7,110	5,752	1,358	181	595	400	33	11	138
South End	0	0	0	0	0	0	0	0	0
Winthrop	11,130	10,609	521	75	222	105	18	15	86
Total	71,080	43,778	27,302	2,360	20,382	2,280	161	480	1,639
% of Total		62%	38%	3%	29%	3%	0%	1%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

Table 3.6-14
Comparison of the 1990-2000 Estimated Population within the 60 dB Contour for the No-Action Alternative of the 29 Million Low Fleet Scenario

	Total Population 1990	Total Population 2000	Non-Hispanic White[1] 1990	Non-Hispanic White[1] 2000	Minority[2] 1990	Minority[2] 2000
Back Bay	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0
Chelsea	10,232	12,047	4,399	3,828	5,833	8,219
Dorchester	0	136	0	111	0	25
East Boston	26,035	30,157	20,527	16,097	5508	14,060
Everett	220	319	214	247	6	72
Jamaica Plain	0	0	0	0	0	0
Long Island	0	0	0	0	0	0
Quincy	0	610	0	544	0	66
Revere	5,227	6,147	4,827	4,872	400	1,275
Roxbury	0	0	0	0	0	0
South Boston	6,010	7,358	5,672	6,065	338	1,293
South End	0	0	0	0	0	0
Winthrop	11,799	11,397	11,559	10,839	240	558
Total	59,523	68,171	47,198	42,603	12,325	25,568
% of Total			79.3%	62%	20.7%	38%

Source: U.S. Census Bureau
1 Includes all persons who indicated their race as White, not of Hispanic origin.
2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3.6.3.12 Noise Affected Minority Population within the 60 dB DNL Contour

Approximately 38 percent of the 2000 Census population that are affected by the 60 dB DNL No Action noise contour are minority. The same percentage of the population affected by the 60 dB DNL Preferred Alternative noise contour is minority (38 percent). While this is a higher percentage than the minority population affected using the 1990 Census (21 percent), the conclusion that there is no difference in the percentage of minority population affected by the No Action and Preferred Alternatives remains the same. The 2000 Census minority population affected by the 60 dB DNL noise contour for the Preferred Alternative (38 percent) is less than the 2000 baseline minority population of Boston, Chelsea, Revere and Winthrop, Everett, and Quincy (44 percent). (See Tables 3.6-14 and 3.6-15.)

Table 3.6-15
Comparison of the 1990-2000 Estimated Population within the 60 dB Contour for the Preferred Alternative of the 29 Million Low Fleet Scenario

	Total Population 1990	Total Population 2000	Non-Hispanic White[1] 1990	Non-Hispanic White[1] 2000	Minority[2] 1990	Minority[2] 2000
Back Bay	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0
Chelsea	10,370	12,047	4,407	3,828	5,963	8,219
Dorchester	0	0	0	0	0	0
East Boston	26,160	30,772	20,650	16,557	5510	14,215
Everett	340	1,956	321	1,441	19	515
Jamaica Plain	0	0	0	0	0	0
Long Island	502	0	252	0	250	0
Quincy	0	610	0	544	0	66
Revere	5,115	5,890	4,727	4,703	388	1,187
Roxbury	0	1,565	0	344	0	1,221
South Boston	6,603	7,110	6,202	5,752	401	1,358
South End	0	0	0	0	0	0
Winthrop	11,328	11,130	11,122	10,609	206	521
Total	60,418	71,080	47,681	43,778	12,737	27,302
% of Total			78.9%	62%	21.1%	38%

Source: U.S. Census Bureau
1 Includes all persons who indicated their race as White, not of Hispanic origin.
2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3.6.3.13 Conclusion for Environmental Justice

As demonstrated by the revised analyses set forth above and in Appendix H, the availability of Census 2000 data does not affect the conclusions of the noise impact analysis or Environmental Justice conclusions of the Supplemental DEIS/FEIR. Overall, compared to the No Action Alternative, the Preferred Alternative still reduces airside congestion and delay, reduces the number of aircraft operations shifted into nighttime hours, moves aircraft operations over water, reduces the number of people exposed to the highest noise levels, and provides flexibility to more equitably distribute airport noise in accordance with the PRAS goals. Specifically, the use of updated Census 2000 population data indicates the following:

- In comparison to the No Action Alternative, the Preferred Alternative still reduces the number of people residing in the areas of highest noise exposure, i.e., the 70 dB and 75 dB DNL contours.
- While the Census 2000 data shows that the minority population of the communities around Logan Airport has increased, the percentage of minority population within the 65 dB DNL contour for both the No Action and the Preferred Alternative continues to indicate that minority populations do not suffer disproportionately from airport noise impacts.
- Significant adverse noise impacts of the Preferred Alternative are not predominately borne by a minority population. Only 34 percent of the population within the 65 dB DNL contour is expected to be minority if the Preferred Alternative is implemented, compared to Boston, Chelsea, Revere and Winthrop which have a total minority population of 48 percent. Therefore, the Preferred Alternative is not expected to cause a disproportionately high and significant adverse impact on minority populations.
- The additional area within the Preferred Alternative 65 dB DNL contour under the 29M Low Fleet worst-case noise scenario includes a predominantly Hispanic neighborhood in Chelsea which is predicted to experience an increase of 0.6 dB DNL or less (Refer to Section 6.8.5 in the Supplemental DEIS/FEIR). Under FAA's standard of 1.5 dB DNL, this change is not a significant adverse impact. Nonetheless, mitigation of the increased noise exposure will be provided to the affected community in the form of residential sound insulation.
- The Preferred Alternative has been reviewed in accordance with the federal Executive Order 12898 and the applicable U.S. DOT Order. After taking into account mitigation measures, the Preferred Alternative will not result in a disproportionately high and adverse impact to minority and/or low-income populations.

3.7 Additional Independent Analysis of Key Technical Issues

In August 2001, FAA asked the MITRE Corporation's Center for Advanced Aviation System Development (MITRE) for assistance in addressing key project issues relating to runway utilization and capacity and delay modeling. MITRE was asked to review four questions and provide an independent assessment concerning certain portions of the EIS technical analysis.[22] These four questions principally related to the operational utility and delay reduction benefits of the proposed unidirectional Runway 14/32:

1) Regional Jet Forecasts – In the 29M RJ and the 37.5M High RJ fleet forecasts, are the percentage of regional jets and the distribution by RJ type reasonable?

2) Runway Usage for Regional Jets – Are the assumptions in the Airside Project EIS regarding the types of RJs that can use Runway 14/32 for arrivals and departures in various wind and runway conditions valid?

3) Delay Results – Are the delay savings forecast in the EIS reasonable, particularly under long-term conditions when large delays are predicted?

4) Limited Capacity Analysis – How do the capacities of two specific runway configurations, 33L/32 & 27 (proposed) and 22L/R & 27 (existing), compare under visual conditions and calm winds?

The first two questions concern the utility of the proposed 5,000-foot runway given the recent influx of regional jets at Logan. Question (1) addresses the percentage and distribution of regional jets in the two EIS fleet forecasts that were specifically developed to reflect recent RJ growth, the 29M RJ and 37.5M High RJ fleet scenarios. Question (2) reviews the takeoff and landing assumptions used in the EIS to determine the expected RJ utilization of Runway 14/32. These assumptions concerning RJ usage of the runway were originally developed during the Supplemental DEIS/FEIR process through an independent FAA analysis of RJ runway use capabilities (see Appendix C of the Supplemental DEIS/FEIR).

The final two questions relate to the capacity and delay benefits of the proposed new runway as forecast in the EIS documents. Question (3) concerns the levels of delays presented in the EIS, particularly under certain of the long-term fleet scenarios, as well as the associated levels of delay savings projected with the proposed airside improvements in place. Question (4) focuses on the capacity of the new three-runway configuration (with Runway 32) compared to one of Logan's existing high-capacity runway configurations. This final question was specifically designed to review the incremental capacity benefit of the new 33L/32 & 27 configuration over the existing 22L/R & 27 configuration under visual conditions and calm winds.

22 See Appendix J, "Review of Selected Topics from the Boston Logan Airport Environmental Impact Statement", MITRE Center for Advanced Aviation System Development, May 2, 2002.

The results of the MITRE review of each of the four issues are presented in greater detail in the following sections.

3.7.1 Topic 1 – Regional Jet Forecasts

The MITRE review focused on two of the nine Airside Project EIS fleet forecasts. These two fleet scenarios were developed to reflect the recent growth in regional jet operations at Logan: the 29M RJ scenario for 2004 (discussed in Section 3.4 of this Final EIS) and the 37.5M High RJ scenario for 2015 (presented in Section 4.2 of the Supplemental DEIS/FEIR). MITRE examined the number and distribution of regional jets in these fleets, and compared them to the scheduled activity at Logan in September 2000 and September 2001. MITRE also considered future airline orders for RJ aircraft.

MITRE's review identified two key changes in regional jet activity from 2000 to 2001. First, in terms of overall fleet mix there was a drop in non-jet activity with a corresponding increase in RJ flights (see Table 3.7-1). Second, among RJ types, there has been an increase in the use of the Fairchild-Dornier 328Jet (see Table 3.7-2). This regional jet type entered Logan service with Atlantic Coast Airlines, which operates under a Delta Air Lines code share at Boston. Over the same period, the use of the Canadair CRJ declined.

Table 3.7-1
Share of Logan Historic and Forecast Traffic (Percent of Total Fleet)

	Scheduled Activity		EIS Scenarios	
Type	Sept 2000	Sept 2001	29M RJ	37.5M High RJ
Turbojets (Excluding RJs)	56%	54%	56%	54%
Non-Jets	34%	26%	21%	12%
RJs	10%	20%	23%	34%

Table 3.7-2
Distribution of Regional Jets at Logan by Type (Percent of RJ Fleet)

	Scheduled Activity		EIS Scenarios	
Type	Sept 2000	Sept 2001	29M RJ	37.5M High RJ
Embraer 135/145	57%	52%	61%	54%
Fairchild-Dornier 328Jet	0%	34%	25%	23%
Canadair CRJ and Others	43%	14%	14%	23%

Based on its review, MITRE concluded that the near-term 29M RJ scenario is consistent with current trends and represents a reasonable estimate of the number of RJ flights and the distribution of flights by RJ aircraft type.

In addition, MITRE found that the EIS projections for RJ activity in the 37.5 High RJ fleet were within the range of reasonable long-term forecasts. If recent trends towards increased activity levels with regional jets continue, and airport capacity constraints do not force a shift to use of larger aircraft, then MITRE concluded that RJs might capture a somewhat larger percentage of the long-term future fleet than forecast in the 37.5M High RJ fleet. MITRE also concluded that the long-term RJ forecasts probably understate the future proportion of Fairchild-Dornier 328Jets in the Logan fleet mix.

3.7-2 Topic 2 – Runway Usage for Regional Jets

During the Supplemental DEIS/FEIR process, an independent FAA analysis of RJ runway use capabilities developed assumptions regarding the ability of various regional jet aircraft to land on Runway 32 (see Appendix C of the Supplemental DEIS/FEIR). These assumptions were then incorporated into all subsequent operational and environmental modeling:

- Fairchild-Dornier 328Jets (FRJs) are capable of landing on Runway 32 in both dry and wet conditions.
- Embraer 135/145 Regional Jets (ERJs) are capable of landing on Runway 32 under dry weather conditions.
- Canadair Regional Jets (CRJs) are technically capable of landing on Runway 32, but would not.

MITRE was asked to review regional jet takeoff and landing capabilities, and held discussions with industry representatives and RJ operators in order to validate the EIS runway utilization assumptions that were developed by the earlier FAA analysis (see Appendix C of the Supplemental DEIS/FEIR). The MITRE review confirmed the validity of the EIS assumptions concerning RJ runway use. Moreover, as discussed in Section 3.3.3 of this Final EIS, FAA corresponded directly with American Eagle and Atlantic Coast Airlines, the two largest RJ operators at Logan. FAA has received written confirmation of these carriers' intentions to utilize Runway 14/32 for RJ operations (see Appendix F of this Final EIS).

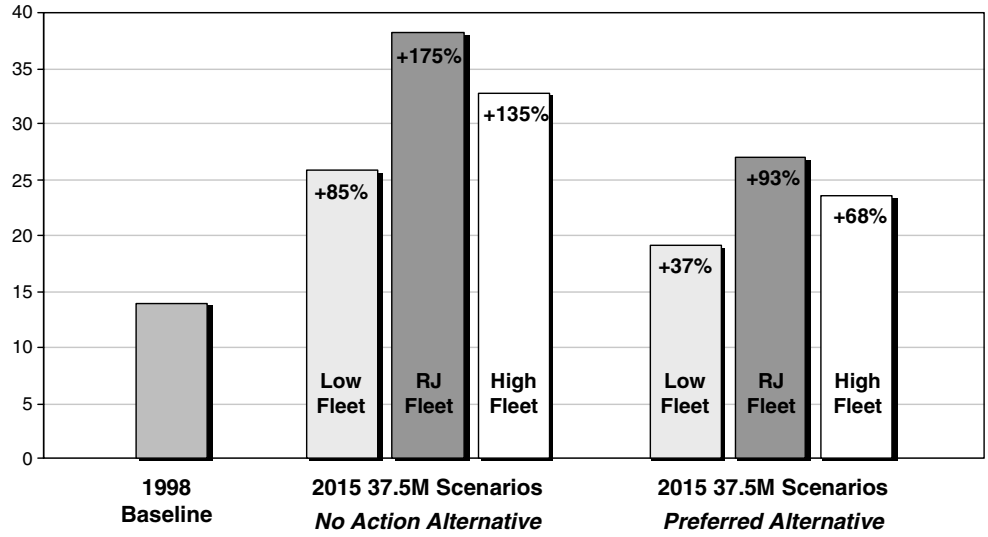
3.7-3 Topic 3 –Delay Results

MITRE reviewed the projections of delay growth in the EIS, assessing the modeled increases in average delays with particular focus on the long-term scenarios. MITRE specifically evaluated the long-term 37.5M fleets to determine whether the long-term levels of operations and delays were attainable. In certain of these scenarios, No Action delay levels are substantial due to the high number of total operations and serious overscheduling during peak periods.

Based on its review of the long-term forecasts, MITRE concluded that delay growth in the 2015 37.5M Low No Action fleet scenario seemed high, but more reasonable than the delay growth predicted for the 37.5M High RJ and High No Action fleet scenarios. Figure

3.7-1 shows the average delays in the 37.5M scenario with and without the Preferred Alternative, as well as the percentage increase in delays relative to 1998 baseline conditions.

Figure 3.7-1
Average Runway-Related Delays by EIS Fleet Scenario and Percent Change Since 1998 - Minutes per Flight



Note: 1998 weather used for 1998 analysis. 1997-1999 weather used for 37.5M High RJ Analysis. 37.5M Low and High analyses used 1981-1990 weather conditions.

MITRE's conclusions were based upon the fact that Logan delays currently approach those for the most congested U.S. airports. In its judgment, delays at Logan are already at or near the limits that airlines and passengers will tolerate. MITRE therefore concluded that airlines, Massport, or the FAA would almost certainly act to limit delay growth before delays could reach the high No Action levels predicted with the long-term EIS fleets. This is consistent with the Airside Project EIS analysis.

With the proposed peak period monitoring system described in Section 4.5.4 of the Supplemental DEIS/FEIR, peak period pricing or an alternate form of demand management would have been initiated before delays reached the levels reflected in the long-term High and High RJ fleet scenarios (see discussion in Sections 1.3 and 3.2 of this Final EIS). Since peak period pricing, a form of demand management, was explicitly considered as an improvement concept in the Airside Project EIS, the No Action forecast scenarios could not reflect the implementation of demand management initiatives. Rather, as a conservative approach, the Airside Project EIS used unconstrained No Action Alternatives. These long-term High fleet forecasts represent a realistic outer range of unconstrained activity and provide a conservative upper bound for environmental impacts under the No Action Alternative.

FAA reviewed MITRE's findings, and added analysis and discussion to this Final EIS concerning high delays in the long-term No Action scenarios, the likelihood that demand

management would be initiated, and the incremental benefits of Runway 14/32 with demand management already in place. These issues are addressed in this Final EIS in Section 1.3 - Passenger Volumes and Aircraft Operations and in Section 1.9 - Delay Modeling Results.

The delay reduction benefits of Runway 14/32 do not depend on a specific level of demand at Logan. The EIS analysis has examined nine different scenarios representing historic, current, near-term, and long-term levels of demand. Under all fleet scenarios, Runway 14/32 has provided significant delay reduction benefit. If it had been available in 1998, the Preferred Alternative would have reduced Logan runway-related delays by 38,000 annual hours (32 percent). Under the long-term 37.5M High RJ fleet, the Preferred Alternative is predicted to reduce Logan delays by 109,000 annual hours (29 percent).

Even with demand management in place to reduce the baseline levels of overscheduling and delays, the addition of Runway 14/32 still provides a significant delay reduction benefit compared to demand management alone. Under the 37.5M High RJ scenario with demand management in place, Runway 14/32 provides an incremental delay reduction benefit of 85,000 annual hours, or 28 percent (see Figure 1.9-3 of this Final EIS).

3.7.4 Topic 4 – Limited Capacity Analysis

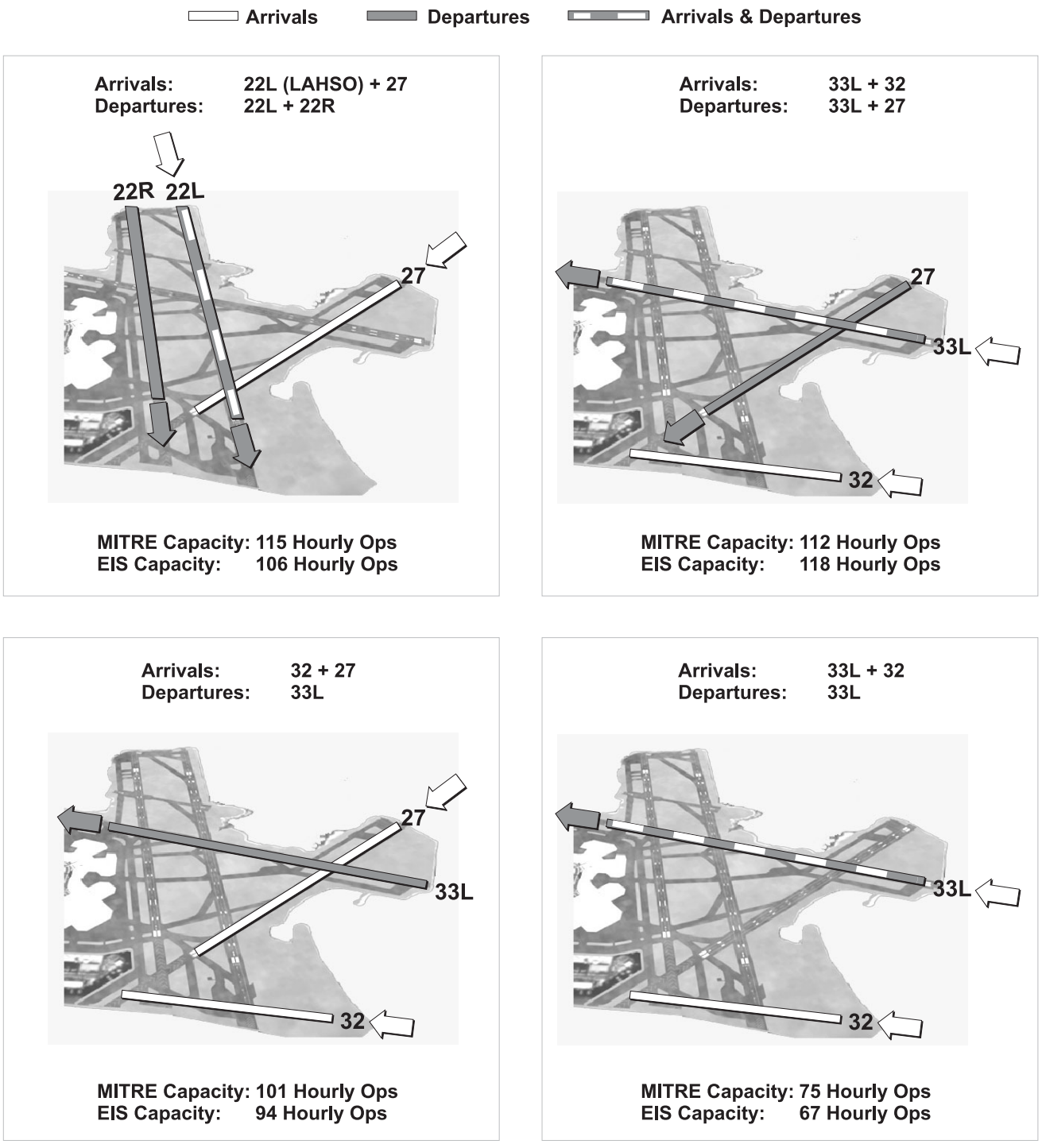
The Airside Project EIS capacity modeling estimates that the highest capacity configuration at Logan involves use of existing Runways 4L/R & 9, a north/south runway configuration. The new runway configuration with Runway 14/32 with Runways 33L/32 & 27 offers the second-highest capacity. The existing configuration with Runways 22L/R & 27 produces the third-highest capacity. FAA wanted to obtain additional information regarding the potential delay reduction and runway use impacts if the second or third rankings differ for capacity or operational reasons. Specifically, FAA wanted to know the impacts if pilots or controllers preferred the use of Runways 22L/R & 27 to the new configuration using Runways 33L/32 & 27. MITRE developed independent capacity estimates for several specific runway configurations based on the 37.5M High RJ fleet mix. This analysis was structured to further examine the relative capacity rankings of the runway configurations, particularly as they relate to the portion of predicted delay reduction benefits that occur under visual conditions and calm winds.

MITRE developed capacities for four different runway configurations:

- Arrive 22L & 27 – Depart 22L & 22R
- Arrive 33L & 32 – Depart 33L & 27
- Arrive 32 & 27 - Depart 33L
- Arrive 33L & 32 – Depart 33L

Figure 3.7-2 compares the MITRE capacity estimates to those developed through the Airside Project EIS capacity analysis.

Figure 3.7-2
Comparison of MITRE and EIS Capacity Analysis



Note: All capacity estimates assume balanced arrivals and departures. Note that the highest capacity configuration using Runways 4L/R & 9 is not presented.

The MITRE and Airside Project EIS capacity estimates are similar, with the Airside EIS modeling producing slightly lower capacities than the MITRE analysis for three of the four runway configurations examined. The key difference is that MITRE predicts that the 22L/R & 27 configuration has a slight capacity advantage over the 33L/32 & 27 configuration (115 hourly operations vs. 112 hourly operations), while the EIS shows a disadvantage (106 hourly operations vs. 118 hourly operations). In effect, while the EIS capacity analysis found the new configuration with Runway 32 to represent the second-highest-capacity runway configuration at Logan, MITRE's capacity analysis found that the new runway configuration ranked third, behind the 22L/R & 27 configuration.

While differing on the capacity rankings, MITRE concluded that the 33L/32 & 27 configuration would provide a capacity that was nearly as high as the 22L/R & 27 configuration, and that the addition of the new three-runway configuration would address Logan delays that occur during northwest winds and would provide more flexibility for distributing aircraft overflights.

In general, the Airside and MITRE modeling methodologies are similar.[23] The Airside Project EIS capacities were developed using a detailed simulation model, the Flexible AirPort Simulation (FLAPS), described in greater detail in Section 3.11 of this FEIS. The MITRE capacity estimates were developed using a simpler analytical model, the Enhanced Airfield Capacity Model (EACM). Both models incorporate detailed operating parameters that reflect aircraft performance, runway assignments, runway occupancy times, separation standards, and runway dependencies. The input parameters for both models were developed through direct consultation with Boston Air Traffic Control Tower (ATCT) personnel, and efforts were made to ensure consistency between the two sets of input assumptions.

The differences between the Airside and MITRE capacity results are small, less than five percent, and are expected when different computer models are used. For example, the Airside and MITRE capacities for the 33L/32 & 27 configuration differ by only six hourly operations (three hourly arrivals and three hourly departures under balanced flow conditions).

It is important to recognize that the modeled capacities reflect a computerized representation of the real world, and can never perfectly capture the interactions between pilots, air traffic controllers, aircraft, and airport infrastructure. While modeling can accurately reflect the required separation distances and runway dependencies when operating a new runway configuration, the practical experience of controllers and pilots plays a crucial role. Initially, the real-world capacity of the 33L/32 & 27 configuration may be lower than the modeled capacity. However, over time, as pilots become more familiar with landing on Runway 32 and controllers become more familiar with sequencing aircraft on the 33L/32 & 27 configuration, the real-world capacity would most likely increase. Other operational considerations that could impact the real-world relative

23 FAA does not require any specific runway capacity model for EIS analyses.

capacities of the 22L/R& 27 and the 33L/32 & 27 configurations include the ability to maximize intersection turboprop departures from Runway 33L, the willingness of pilots to land on Runway 32, and the ability to maximize 22L departures given constraints such as the shared noise abatement procedure for jet departures from 22R and 22L.

FAA conducted additional modeling to evaluate the potential impacts of this difference in the relative capacity rankings of the two runway configurations. In consultation with MITRE, the Airside Project EIS DELAYSIM model (see Section 3.11 of this Final EIS) was used to perform a sensitivity analysis of the delay reduction and runway utilization impacts associated with the MITRE capacity estimates. Table 3.7-3 compares the delays based on the MITRE capacities to the Airside Project EIS results for the 37.5M High RJ fleet under the No Action and Preferred Alternatives. The table also presents the runway utilization for selected runway ends impacted by the use of the 33L/32 & 27 configuration.

Table 3.7-3
Analysis of Alternative Capacity Assumptions – 2015 37.5M High RJ Fleet

		EIS Capacities		MITRE Capacities	
	2000 Actual	No Action	Preferred Alternative	No Action	Preferred Alternative
Delays Analysis					
Annual Hours of Delay		372,220	263,489	344,812	266,997
Hours of Delay Reduction			108,731		77,815
Percent Delay Reduction			29.2%		22.6%
Runway Use Analysis					
Rwy 27 Jet Departures	15.0%	5.8%	29.2%	6.0%	15.8%
Runway 33L Jet Departures	6.0%	2.0%	10.8%	2.0%	7.1%
Jet Arrivals to 33L and 32	20.0%	9.7%	39.8%	10.2%	24.1%
Jet Use of North/South Runways	76.5%	89.8%	56.0%	89.4%	73.9%

With either the Airside Project EIS capacities or the MITRE capacities, Runway 14/32 provides substantial delay reduction benefits. Delays would be reduced by between 23 and 29 percent, to a level between 263,000 and 267,000 annual hours. With the MITRE capacity assumptions, the delay reduction benefits associated with the Preferred Alternative would be less than those projected under the Airside Project EIS assumptions. However, the 78,000 annual hours of delay reduction with the MITRE capacities still confirm the substantial benefits of Runway 14/32.

Under the No Action Alternative with the MITRE capacity assumptions, baseline delays are lower because a higher capacity was assumed for the 22L/R & 27 configuration than projected with the Airside Project EIS assumptions (see Table 3.7-3). Under the Preferred Alternative with MITRE's capacity assumptions, delays are slightly higher due to the reduced capacity of the 33L/32 & 27 configuration. Overall, the delay savings are reduced

under the MITRE capacity assumptions when compared to the Airside Project EIS assumptions.

When comparing the No Action and Preferred Alternatives, the MITRE estimates of capacity result in shifts in runway utilization that are less dramatic than the shifts in runway use predicted based on the Airside Project EIS capacity estimates. Runway utilization under the No Action Alternative is essentially identical for the two sets of capacity assumptions. However, with Runway 14/32, MITRE's lower capacity estimate for the 33L/32 & 27 configuration reduces the number of times that air traffic controllers shift to the northwest configuration, leaving more flights on the north/south runway configurations. It is important to note that the individual runway end use associated with the Preferred Alternative under the MITRE capacity assumptions is between the corresponding runway end use of the No Action and Preferred Alternatives developed with the Airside Project EIS capacities. For example, with the MITRE capacities, jet departures from Runway 27 represent 16 percent of total jet departures, between the 6 percent and 29 percent associated with the No Action and Preferred Alternatives under the Airside Project EIS capacities. In general, with the MITRE capacities, the changes in Logan runway use caused by Runway 14/32 are similar, but less pronounced, than the changes that were predicted based on the EIS capacities.

3.7.5 Conclusions

FAA's findings based on consideration of the MITRE technical analysis are summarized below:

- The 29M RJ scenario is consistent with current trends and represents a reasonable near-term estimate of the number and distribution of RJ flights. The share of regional jets in the 37.5M High RJ scenario is within the range of reasonable long-term forecasts, but the projected share of RJs may be lower than what could potentially occur.
- The EIS assumptions concerning RJ runway use are reasonable. FAA has corresponded directly with American Eagle and Atlantic Coast Airlines, the two largest RJ operators at Logan, and has received written confirmation of these carriers' intentions to utilize Runway 14/32 for RJ operations (see Appendix F of this Final EIS).
- MITRE concluded that airlines, Massport, or the FAA would almost certainly act to limit delay growth before delays could reach the high No Action levels predicted with the long-term EIS fleets. This is consistent with the Airside Project EIS analysis. This Final EIS acknowledges that demand management would have been initiated before delays reached the levels reflected in the long-term High fleet scenarios. Since peak period pricing, a form of demand management, was explicitly considered as an improvement concept in the Airside Project EIS, the No Action forecast scenarios could not reflect the implementation of demand management initiatives. Rather, as a conservative approach, the Airside Project EIS used unconstrained No Action Alternatives. These long-term High fleet forecasts represent a realistic outer range of

unconstrained activity and provide a conservative upper bound for long-term environmental impacts under the No Action Alternative.

- MITRE determined that the capacity of the 33L/32 & 27 configuration was nearly as high as that of the 22L/R & 27 configuration. FAA therefore concludes that the new configuration with Runway 14/32 provides additional capacity during northwest wind conditions and reduces delays significantly when Logan is forced to operate on two or fewer runways.
- A sensitivity analysis demonstrated that with either the Airside Project EIS capacities or the MITRE capacities, Runway 14/32 provides substantial delay reduction benefits, reducing delays by 23 to 29 percent. With the MITRE capacity assumptions, the Preferred Alternative produces less dramatic shifts in runway use when compared to the shifts that were predicted based on the Airside Project EIS capacities. The runway end use associated with the Preferred Alternative under the MITRE capacity assumptions is in between the runway end use associated with the No Action and Preferred Alternatives under the Airside Project EIS capacities.

Overall, FAA concludes that MITRE's analysis validates the purpose and need for Runway 14/32. MITRE's analysis showed that the runway will provide additional capacity under moderate to high northwest winds and that it will provide the operational flexibility to permit more frequent use of the northwest operating direction. FAA also concludes that the Airside Project EIS modeling assumptions and the methodology used throughout the EIS analysis are valid and produce a reasonable representation of the range of environmental impacts associated with the proposed Airside improvements.

3.8 Evaluation of a Wind Restriction on Runway 14/32

The delay reduction benefits of the proposed unidirectional Runway 14/32 are principally realized during moderate to high northwest winds. Currently, when wind conditions require air traffic control to operate to the northwest, available airfield capacity declines as operations shift from Logan's normal three-runway configurations to the lower-capacity configurations associated with Runways 33L and 27 or Runway 33L alone. With Runway 32 available for arrivals, air traffic controllers would have a third available runway to prevent the drop in capacity and high levels of delay that currently occur during these northwest wind conditions.

The new 33L/32 & 27 runway configuration would substantially reduce delays that occur during northwest wind conditions at Logan. The new configuration will also provide the opportunity for air traffic controllers to more evenly distribute flights over the greater Boston area during periods of calm wind and high demand. Logan currently relies primarily on the north/south runway configurations under these high demand conditions, resulting in greater noise impacts on the north/south communities. By providing additional high-capacity three-runway configurations, Runway 14/32 could allow a redistribution of flights that would improve performance relative to both the annual and short-term goals of Logan's Preferential Runway Advisory System (PRAS) and provide benefits to residents impacted by the north/south runways.

The potential redistribution of flights results primarily from the availability of the new 33L/32 & 27 configuration. With increased use of this new three-runway northwest configuration, the share of departures from Runways 27 and 33L increases above current levels. This predicted increase in aircraft overflights affects communities to the west and northwest of Logan and has been a source of controversy as evidenced by numerous public comments on the Draft EIS/EIR (see Supplemental DEIS/FEIR, Response to Comments Volumes 4 through 11).

In an attempt to address these public concerns, the SDEIS Panel process identified wind/weather restrictions on the use of Runway 14/32 as one area for additional study by the FAA and Massport. A northwest wind restriction was considered a means to address the changes in runway utilization associated with Runway 14/32, particularly the increase in departures from Runways 27 and 33L. The Supplemental DEIS/FEIR evaluated the delay and runway use implications of restricting the use of Runway 32 to northwest wind conditions only (see Section 4.7.6 and Appendix D of the Supplemental DEIS/FEIR).[24] This analysis demonstrated that a northwest wind restriction could be an effective mechanism to limit the changes in utilization for Runways 27 and 33L.

24 Section 4.7.6 and Appendix D of the Supplemental DEIS/FEIR examined the impacts of 5, 10, 15, 20, and 25-knot northwest wind restrictions on the 37.5M High RJ Fleet. This fleet scenario was selected so that the long-term impacts of a northwest wind restriction could be evaluated with a fleet that represented the most recent trends at Logan, particularly the recent growth in regional jets. Delays and runway use were examined for all five potential wind speed restrictions. Noise contours and population counts were developed for the 5-knot northwest wind restriction case to provide an indication of the potential noise impacts of a restriction.

While the predicted redistribution of flights with an unrestricted Runway 14/32 would be consistent with the PRAS goals, the Community Advisory Committee (CAC) has withdrawn its support of those goals. In addition, Massport, with support from the FAA, has committed to begin working with CAC to reassess the PRAS program as part of its Section 61 Findings. Section 4.3 of the Supplemental DEIS/FEIR includes a more detailed discussion of PRAS, and Section 4.2 of this Final EIS describes the mitigation commitment to reassess PRAS.

Given that PRAS will be reassessed, this Final EIS further examines a wind restriction on Runway 14/32 as a mitigation measure to prevent major shifts in runway utilization. This section expands upon the wind restriction analysis that was included in the Supplemental DEIS/FEIR. The analysis further examines the relationship between the delay reduction and runway end use associated with a wind restriction, and discusses the implications of such a restriction on noise exposure patterns and other environmental impacts.

Sections 3.8.1 through 3.8.5 examine a northwest wind restriction on Runway 32. The analysis confirmed the Supplemental DEIS/FEIR conclusion that a northwest wind restriction could limit the changes in departure utilization for Runways 27 and 33L and also found that a restriction would preserve most of the delay reduction benefits of Runway 14/32. However, the analysis also identified an unanticipated consequence of the northwest wind restriction -- increased nighttime arrivals over the communities to the northwest of the airport. To mitigate this additional runway use impact of the northwest wind restriction, a northwest/southeast restriction on the use of Runway 14/32 is examined in Section 3.8.6. Section 3.8.7 recommends a 10-knot northwest/southeast wind restriction on Runway 14/32 as mitigation for the Preferred Alternative. Since PRAS will be reassessed, any recommendation concerning a wind restriction that might result from the updated PRAS would be subject to appropriate environmental review. See Section 4.1.2 of this Final EIS for additional information on the proposed wind restriction commitment.

3.8.1 Methodology and Assumptions for the Northwest Wind Restriction Analysis

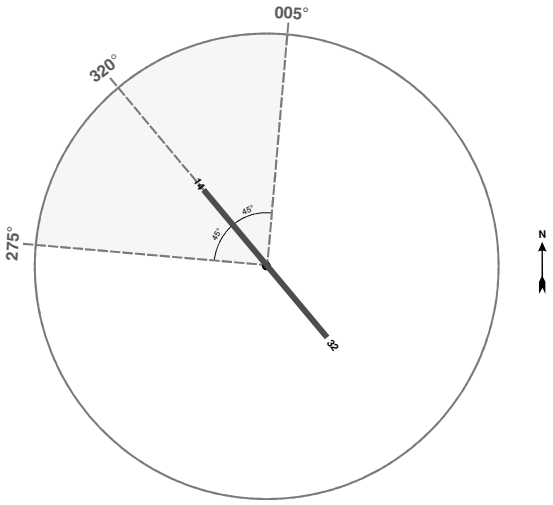
In framing the analysis of potential wind restrictions, parameters were developed to identify the wind direction and wind speed conditions under which Runway 14/32 would be available for use. These parameters are described in the following sections, along with the fleet mix assumptions used to evaluate the impacts of the wind restrictions.

3.8.1.1 Wind Direction

In modeling the various wind restriction scenarios, Runway 32 was made available for arriving aircraft only when the wind direction was within the 90-degree quadrant between 275° and 005° (i.e., 45 degrees on either side of the 320° runway heading). The wind direction criterion is displayed in Figure 3.8-1. When the wind direction was not within the defined quadrant, Runway 32 was not available for use. It was initially

assumed that Runway 14 departures would not be restricted, but this assumption was later revised (see Section 3.8.6).

Figure 3.8-1
Northwest Quadrant Restriction

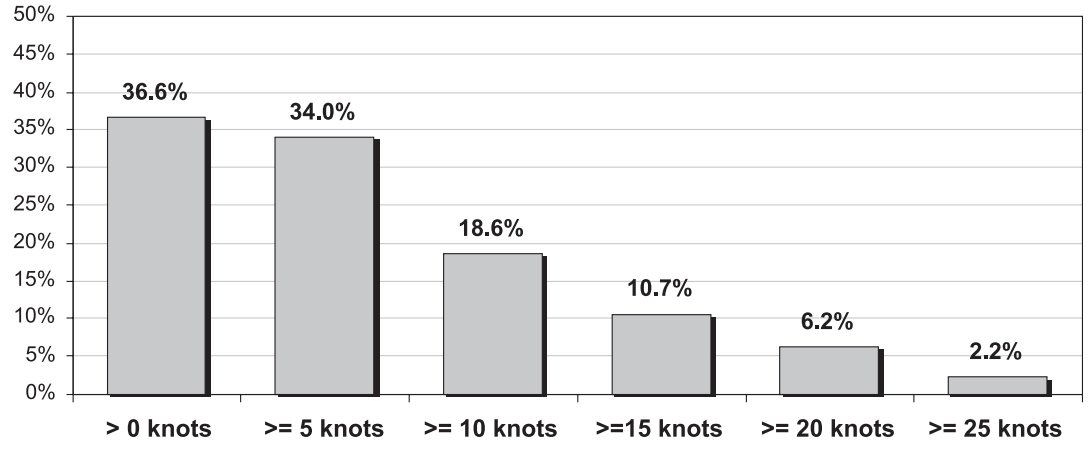


3.8.1.2 Wind Speed

Alternative wind speed criteria of 5, 10, 15, 20, and 25 knots were used to evaluate a northwest wind restriction on Runway 32. Under the 5-knot scenario, Runway 32 was available for arrivals when the wind direction was between 275° and 005°, and the wind speed with gusts was 5 knots or greater. As the wind speed threshold was progressively increased from 5 knots to 25 knots, the percentage of time the runway was available for use declined.[25] Figure 3.8-2 presents the availability of Runway 32 under wind speed restrictions of increasing strength. Overall, winds at Logan are from the northwest quadrant approximately 37 percent of the time.

25 FAA Order 7110.65, *Air Traffic Control*, recommends use of the runway most nearly aligned with the wind when the wind speed is 5 knots or more, unless use of another runway would be operationally advantageous or is requested by the pilot. FAA Order 8400.9, *National Safety and Operational Criteria for Runway Use Programs*, addresses safety requirements for runway use programs such as Logan's Preferential Runway Advisory System (PRAS). It provides that while aircraft operations should be conducted into the wind, considerations such as capacity and delay problems, runway length, approach aids, noise abatement, and other factors may require operations to be conducted on runways not directly aligned into the wind. It recommends a maximum crosswind of 20 knots under dry conditions and 15 knots under wet conditions. It also establishes a dry tailwind limit of 5 to 7 knots and a wet tailwind limit of 0 to 3 knots. Logan has established similar limits in Boston Tower Order 7040.1, *Noise Abatement*.

Figure 3.8-2
Percentage of Time Winds are from the Northwest Quadrant at Various Wind Speeds



Source: 1997-1999 CODAS Weather Database

3.8.1.3 Fleet Scenarios

The EIS examined nine different fleet scenarios reflecting historic, near-term, and long-term forecasts of aviation activity. The analysis of the wind restriction is limited to two fleet scenarios, the 29M Low scenario and the 37.5M High RJ scenario. The 37.5M High RJ scenario was used to evaluate the long-term delay and runway use impacts of a wind restriction. The 29M Low scenario was used to assess the noise and other environmental implications of restricting the use of Runway 32. As discussed in more detail below, these different scenarios were selected in order to reflect both the long-term operational impacts and a conservative estimate of the total noise and environmental impacts of restricting the use of Runway 32.

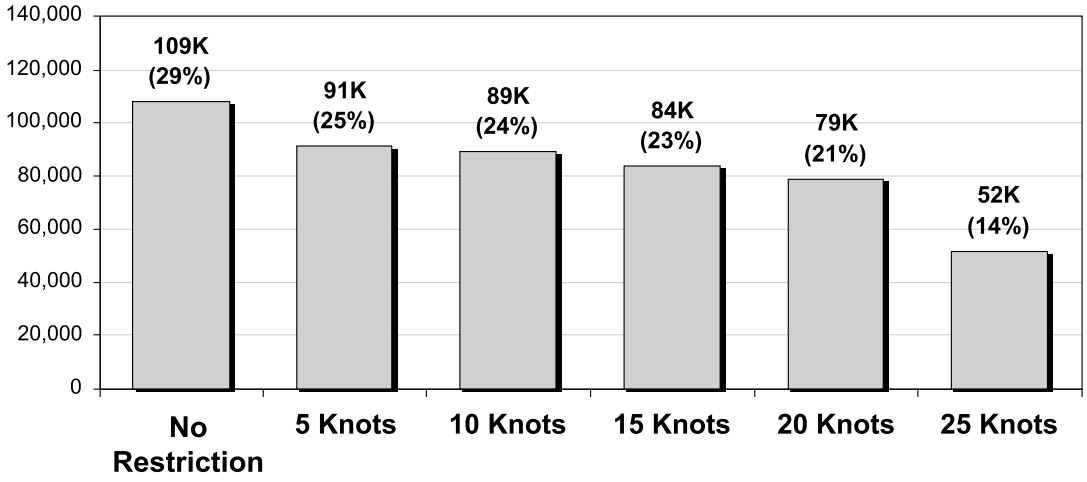
The 37.5 million passenger scenario represents a Logan passenger level that is not expected until the year 2015. During the EIS process, this passenger growth scenario was evaluated using three different fleet mixes: 37.5M Low, 37.5M High RJ, and 37.5M High. The 37.5 M High RJ fleet was selected to evaluate the potential long-term operational impacts of a wind restriction because this fleet reflects the most recent trends at Logan, particularly the recent growth in regional jets. This fleet includes approximately 584,000 annual operations—between the 37.5M Low and High fleet scenarios—and is characterized by a substantially higher volume of regional jet aircraft and far fewer non-jet aircraft than are present in the other long-term fleets. This unconstrained long-term scenario represents a reasonable outer range of activity. The 37.5M High RJ fleet was examined using hour-by-hour weather for the three-year period between 1997 and 1999, as reported by the FAA in the CODAS weather database. This is the same weather database that was used in evaluating all of the proposed airfield improvements for the 37.5M High RJ scenario.

The 29M Low fleet was used to examine the noise and other environmental impacts of a wind restriction, and represents a passenger level that is expected in 2004. This scenario is the mitigation fleet for the sound insulation program. It has the highest proportion of hushkitted aircraft and represents an upper bound on total noise exposure. The 29M Low fleet includes approximately 510,000 annual operations. It was examined using hour-by-hour weather for the ten-year period between 1981 and 1990. This is the same weather database that was used in evaluating all of the proposed airfield improvements for the 29M Low scenario.

3.8.2 Delay Reduction with a Northwest Wind Restriction

The unrestricted Preferred Alternative (Alternative 1A) reduces forecast annual delays at Logan by 109,000 hours, or 29 percent, relative to the No Action Alternative under the 2015 37.5M High RJ scenario. Figure 3.8-3 shows the absolute and percentage reduction in annual Logan delays relative to the No Action scenario that could be achieved in the year 2015 with various restrictions on the use of the proposed runway.

Figure 3.8-3
Annual Hours of Delay Reduction Relative to No Action –
2015 37.5M High RJ Fleet with Various Northwest Restrictions



With a northwest wind restriction at a threshold of 5 to 20 knots, most of the predicted delay reduction benefits of an unrestricted Runway 32 would be retained. In addition, the loss in delay reduction benefits as the wind speed threshold is progressively increased between 5 and 20 knots is relatively small. With a 5-knot northwest wind restriction, Runway 32 would reduce delays by 91,000 hours annually (25 percent) relative to the No Action Alternative, providing 84 percent of the delay reduction benefits of the unrestricted Runway 32. The increase in delays compared to the unrestricted scenario is a result of the incremental capacity benefits of Runways 33L/32 and 27 over Runways 22L/22R and 27. These benefits are associated with relatively calm wind conditions. Section 3.7.4 presents additional analysis of the relative capacities of these two

configurations and their impact on delay reduction and runway use. Under the alternative capacity assumptions analyzed in Section 3.7.4, the differences between the delay reduction benefits with and without the various northwest wind restrictions would be even smaller. With a northwest wind speed threshold ranging from 5 to 20 knots, Runway 32 continues to achieve most of the delay reduction benefits associated with an unrestricted runway. The runway meets the purpose and need of the project by substantially reducing delays during northwest wind conditions.

With a 25-knot restriction, Runway 32 reduces delays by only 52,000 hours or 14 percent as compared to the No Action Alternative. With this wind speed threshold, Runway 32 would achieve only half the delay reduction benefits available with the unrestricted Preferred Alternative.

As these results demonstrate, Runway 32 provides significant delay reduction benefits with or without a northwest wind restriction in place. These delay reduction benefits decrease as the proposed wind restriction increases, but with a wind restriction of 20 knots or less, most of the delay reduction benefits of the unrestricted Preferred Alternative are retained. Thus, Runway 32 with a wind restriction of 20 knots or less is beneficial because it continues to substantially reduce delays during northwest wind conditions.

3.8.3 Runway Utilization Patterns with a Northwest Wind Restriction

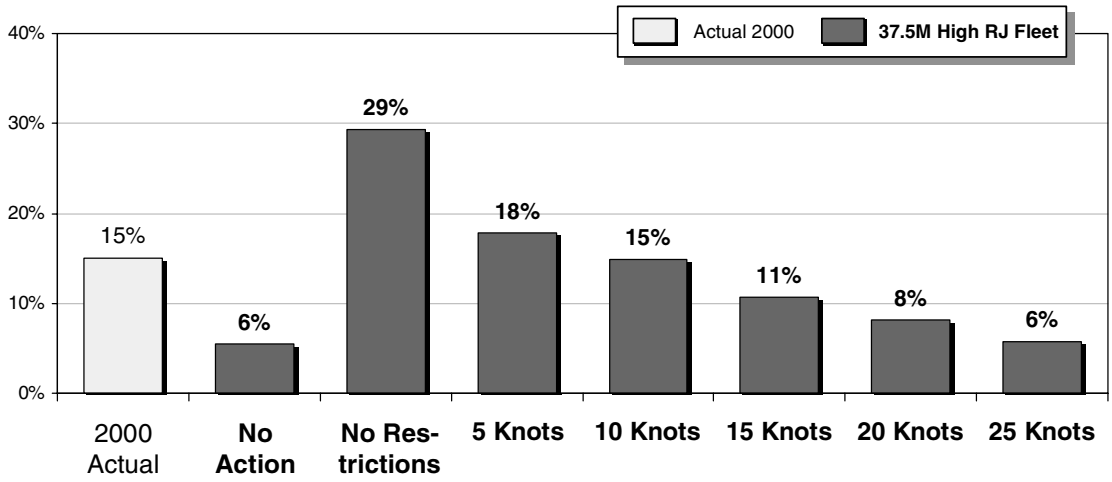
The availability of an additional three-runway configuration under northwest wind conditions reduces delays, but also provides the opportunity to redistribute aircraft flights in accordance with the PRAS goals. The northwest wind restriction was considered as a mechanism to limit Runway 32's potential impact on runway utilization patterns, and on departures from Runways 27 and 33L in particular.

3.8.3.1 Runway 27 Departures

Figure 3.8-4 demonstrates that under the No Action scenario, use of Runway 27 for jet departures is forecast to decline from 15 percent in CY 2000 to 6 percent under the 2015 37.5M High RJ scenario. This projected decline occurs because the higher hourly demand levels in the long-term fleet would increase Logan's reliance on the existing, high-capacity north/south runway configurations. Aircraft do not depart from Runway 27 when the north/south three-runway configurations are in use.

With the addition of an unrestricted Runway 32, the use of Runway 27 is projected to increase from 15 percent of Logan's total jet departures in CY 2000 up to 29 percent. This increase occurs because the new three-runway configuration with Runway 32 provides an additional high-capacity configuration during northwest wind conditions and can be used to redistribute noise in accordance with the PRAS goals. As Figure 3.8-4 depicts, this increase in the use of Runway 27 can be effectively mitigated or negated by restricting Runway 32 for use during northwest wind conditions only.

Figure 3.8-4
Impacts of Various Northwest Wind Restrictions on Use of Runway 27
Runway 27 Share of Logan Jet Departures – 2015 37.5M High RJ Fleet



With a 5-knot northwest wind restriction, Runway 27 is projected to handle approximately 18 percent of jet departures. With a 10-knot restriction, the modeled use of Runway 27 is 15 percent. This is equal to the share of jet departure activity on Runway 27 in CY 2000. Thus, a 10-knot northwest wind restriction would serve to maintain the status quo in those areas of South Boston (Andrews Square) and Roxbury that are predicted to receive additional noise from an increased share of Runway 27 departures with an unrestricted Runway 14/32. As the modeled wind speed threshold is increased to 15-knots or higher, the share of jet departures on Runway 27 declines below CY 2000 levels. With a 25-knot northwest wind restriction, the share of jet departures from Runway 27 would not increase above the level predicted in 2015 if Runway 14/32 were not built.

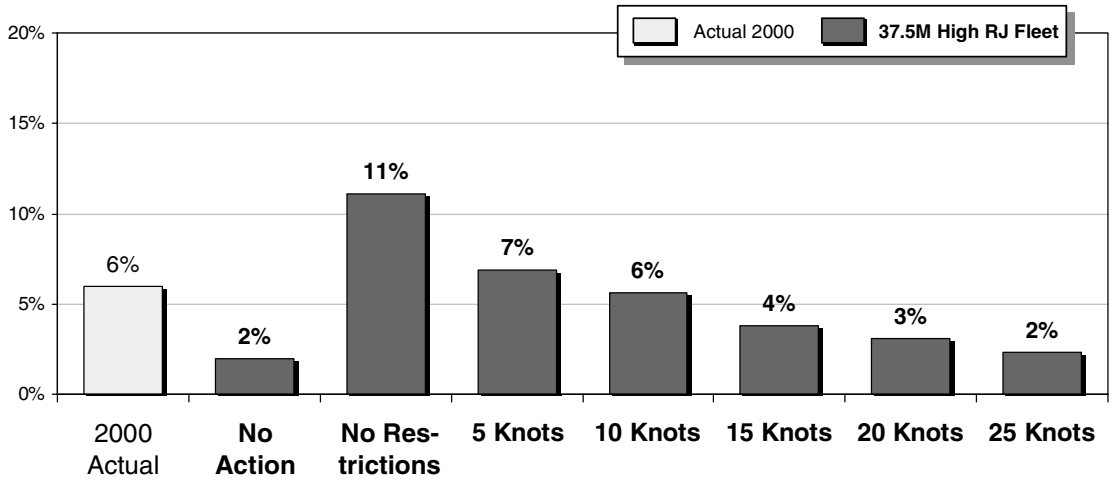
The effect of a northwest wind restriction on the use of Runway 27 for departures is shown in Figure 3.8-4. With a northwest wind restriction as a mitigation measure, the share of Runway 27 jet departures can be limited to levels similar to or less than the levels experienced in CY 2000. This reduction in overflights would provide relief to residents of communities impacted by Runway 27 departures.

3.8.3.2 Runway 33L Departures

As shown in Figure 3.8-5, a northwest wind restriction on Runway 32 would impact departures from Runway 33L in the same manner that it would impact departures from Runway 27. With an unrestricted Runway 32, the use of Runway 33L is projected to increase from 6 percent of jet departures in CY 2000 up to 11 percent. This affects parts of Chelsea, Everett, and East Boston (Eagle Hill). With a 5-knot northwest wind restriction, the projected use of Runway 33L is 7 percent of Logan's jet departures. With a 10-knot restriction, the use of Runway 33L is 6 percent. As with Runway 27, a 10-knot wind restriction most closely matches the share of jet departure activity on Runway 33L in CY 2000 and would provide relief to those areas of Chelsea, Everett, and East Boston (Eagle

Hill) that are predicted to receive additional noise from the increased use of Runway 33L under the unrestricted scenario. Increasing the wind speed threshold to levels of 15-knots or greater would cause Runway 33L's share of Logan jet departures to decline below CY 2000 levels. At a 25-knot wind restriction, use of Runway 33L would not increase above the amount predicted to occur in 2015 if Runway 14/32 were not built.

Figure 3.8-5
Impacts of Various Northwest Wind Restrictions on Use of Runway 33L
Runway 33L Share of Logan Jet Departures – 2015 37.5M High RJ Fleet



The effect of a wind restriction on the use of Runway 33L for departures is shown in Figure 3.8-5. With an unrestricted Runway 14/32, use of 33L departures is predicted to increase. With a northwest wind restriction in place, this increase can be mitigated, and Runway 33L departure shares can be maintained at levels similar to or below historical levels (CY 2000).

3.8.3.3 Utilization of Other Runways

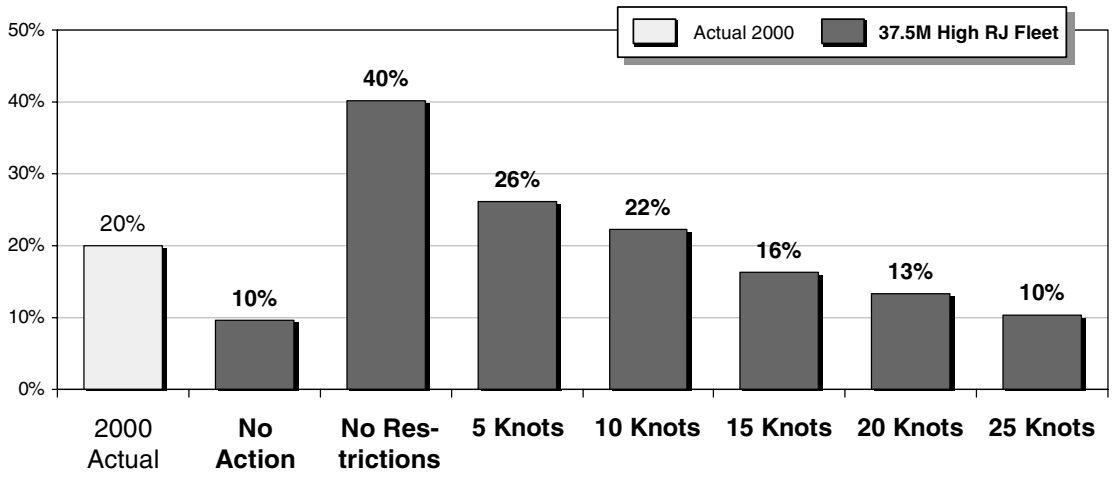
As with any noise abatement measure that impacts the use of certain runways, there will be corresponding changes in the use of other runways as controllers reallocate traffic. An unrestricted Runway 14/32 increases predicted jet departures from Runways 27 and 33L, but it also provides benefits by increasing the number of over-the-water arrivals, improving performance relative to the PRAS goals, and reducing reliance on the north/south runways that affect the surrounding communities most heavily impacted by noise. While a northwest wind restriction would mitigate the increased use of Runways 27 and 33L departures, it would moderate the benefits of the unrestricted Runway 14/32. Nevertheless, when a northwest wind restriction is compared to the No Action Alternative, use of over-the-water arrivals would be increased, PRAS performance would be improved, and there would be less use of the north/south runways. These impacts are discussed in more detail below.

Over-the-Water Arrivals

Arrivals to Runways 33L and 32 approach Logan over Boston Harbor and are considered over-the-water arrivals because the closest populated land area overflown is the tip of the Hull Peninsula, approximately five miles from the runway ends. In contrast, arrivals to the north/south parallel runways fly over populated areas until they are within one mile of the runway ends.

Runway 32 creates a new three-runway configuration (Runways 33L/32 & 27) that allows increased use of over-the-water arrivals to Logan. Under the No Action scenario without Runway 14/32, the increased demand levels in the 2015 37.5M High RJ fleet reduce over-the-water jet arrivals on Runways 33L from 20 percent of CY 2000 jet arrivals down to only 10 percent under the 37.5M High RJ scenario.

Figure 3.8-6
Impacts of Various Northwest Wind Restrictions on Use of Over-the-Water Approaches - Runways 33L and 32 Share of Jet Arrivals – 2015 37.5M High RJ Fleet



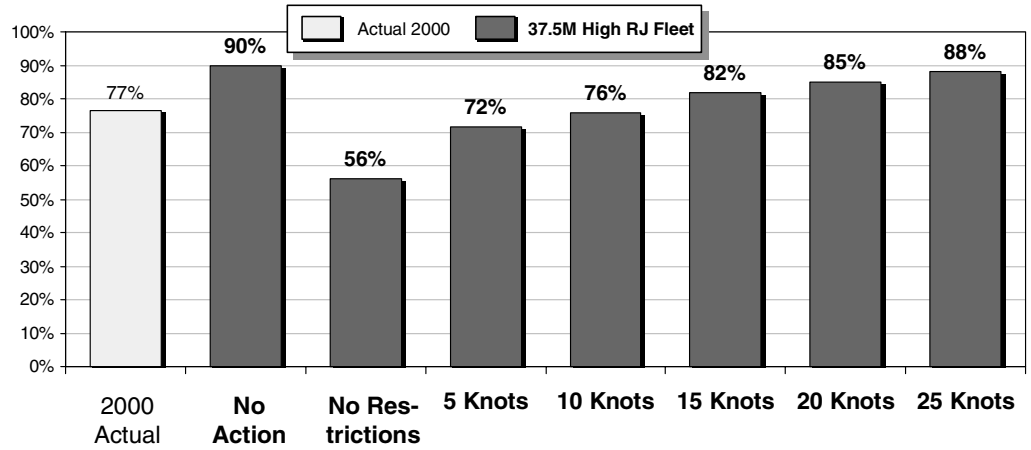
As shown in Figure 3.8-6, adding Runway 14/32 increases the ability of air traffic controllers to route inbound flights over the water. In the unrestricted case, projected over-the-water jet arrivals increase from 10 percent under the No Action Alternative to 40 percent. With a 5-knot northwest wind restriction, 26 percent of jet arrivals are projected to utilize over-the-water flight paths. With a 10-knot restriction, 22 percent of all jet arrivals would utilize over-the-water approaches. This is similar to the 20 percent of jet arrivals that utilized over-the-water approaches in CY 2000. With a 15-knot restriction, approximately 16 percent of jets would arrive over the water, and this number declines to 13 percent if a 20-knot restriction is applied. With a 25-knot wind restriction on the use of Runway 32, approximately 10 percent of all jets would arrive on over-the-water flight paths to Runways 33L or 32, similar to the percentage of over-the-water jet arrivals estimated without Runway 14/32 under the No Action scenario. In general, Figure 3.8-6 demonstrates that even with a northwest wind restriction, Runway 14/32 could increase the number of over-the-water arrivals when compared to the No Action Alternative.

Similar to the analysis of Runways 27 and 33L, a 10-knot wind restriction would most closely maintain the historical distribution of jets that use over-the-water approaches.

Use of the North/South Runways

Runway 14/32 will provide relief to communities impacted by jet activity on the north/south runway combinations (e.g., Runways 4L/4R & 9 and Runways 22L/22R & 27) that receive the majority of Logan's jet flights. As shown in Figure 3.8-7, without Runway 14/32, the increased demand levels in the 37.5M High RJ fleet will increase use of the north/south runways from 77 percent in CY 2000 to as high as 90 percent under the 37.5M High RJ No Action scenario. The use of Runway 14/32, with or without a northwest wind restriction, will mitigate this increase. With a 5-knot restriction on Runway 32, use of the north/south runways declines to 72 percent of jet operations compared to 90 percent under the No Action Alternative. With a 10-knot restriction, north/south runway utilization is estimated at 76 percent, roughly equivalent to the north/south runway utilization in CY 2000. As the wind speed threshold is increased to 15-knots and beyond, use of the north/south runways increases to between 82 percent and 88 percent. These levels are above CY 2000 utilization but below the levels that are predicted to occur if the runway is not built. Thus, with any of the examined wind restrictions, the use of the north/south runway configurations will be below the levels that are predicted to occur if no action is taken, and the new runway will continue to provide relief to the north/south communities as demand at Logan continues to grow.

Figure 3.8-7
Impacts of Various Northwest Wind Restrictions on Use of North/South Runways
North/South Runway Share of Logan Jet Operations – 2015 37.5M High RJ Fleet

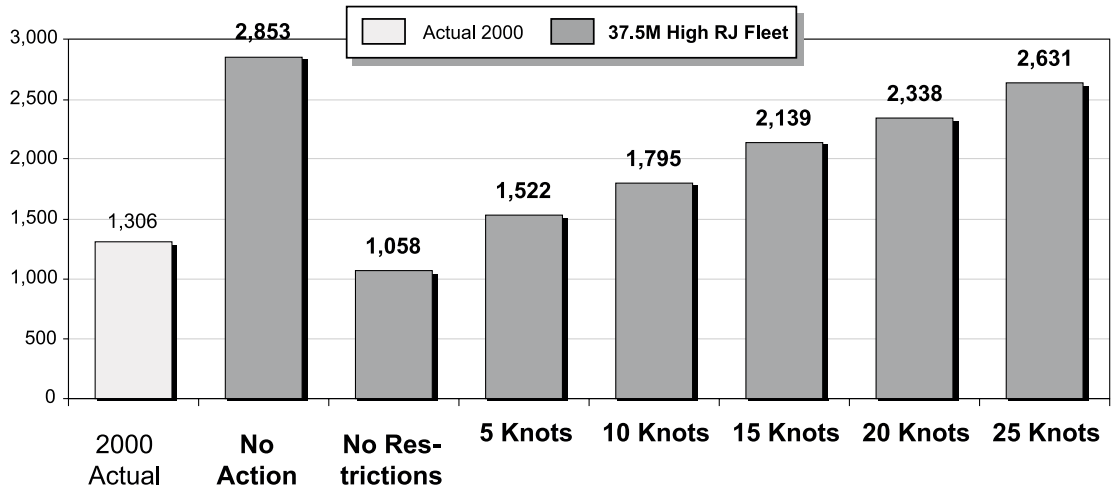


PRAS Performance

Figure 3.8-8 shows the impact of the various northwest wind restrictions on PRAS performance relative to the long-term runway use goals. The PRAS Performance Index (PPI) presented in the figure measures the deviations from the PRAS goals for each Logan runway (see Section 4.3.8 of the Supplemental DEIS/FEIR for more a more detailed discussion of PRAS and its goals). The PPI is calculated as the sum of squared deviations

from the PRAS goals, which is the same measure used in the PRAS selection algorithm to determine the best configuration relative to the annual goals on an ongoing basis. Because the PPI measures differences from the runway utilization goals, lower values represent better PRAS performance. Simply put, the PPI provides the FAA, Massport and communities with a measuring stick for determining performance related to the annual PRAS goals.

Figure 3.8-8
Impacts of Various Northwest Wind Restrictions on Annual PRAS Goal Performance
PRAS Performance Index – 2015 37.5M High RJ Fleet



By creating a third three-runway configuration at Logan, Runway 14/32 would provide controllers with the opportunity to more evenly distribute annual flight activity across different runways. It would also enable them to improve performance relative to the short-term PRAS goals to give communities temporary relief from overflights. Even with a northwest wind restriction, Runway 32 will improve controllers' flexibility to select runway configurations and to improve performance relative to the PRAS goals when compared to the No Action Alternative.

3.8.4 Noise Impacts with a Northwest Wind Restriction

As stated previously, the analysis of the noise impacts of a northwest wind restriction focuses on the 29M Low fleet because this fleet has the highest percentage of hushkitted Stage 3 aircraft and will thus have greater total noise impacts than the other quieter fleet scenarios. Using the 29M Low fleet to analyze noise will enable the surrounding communities to understand the greatest noise they are likely to experience with either a restricted or unrestricted Runway 14/32. Northwest wind restrictions ranging from 5 to 20 knots were examined to determine how the wind speeds associated with the restriction would affect both the noise contours and the impacted populations.[26] Since the 25-knot

26 In the Supplemental DEIS/FEIR, a 5-knot restriction was examined using the long-term 37.5M High RJ fleet. See Section 4.7.6 and Appendix D of the Supplemental DEIS/FEIR. This fleet scenario was selected so that the long-term impacts of a northwest wind restriction could be evaluated with a fleet

restriction reduced the delay reduction benefits of Runway 14/32 by approximately 50 percent as compared to the unrestricted scenario, it was not subject to this more detailed noise analysis.

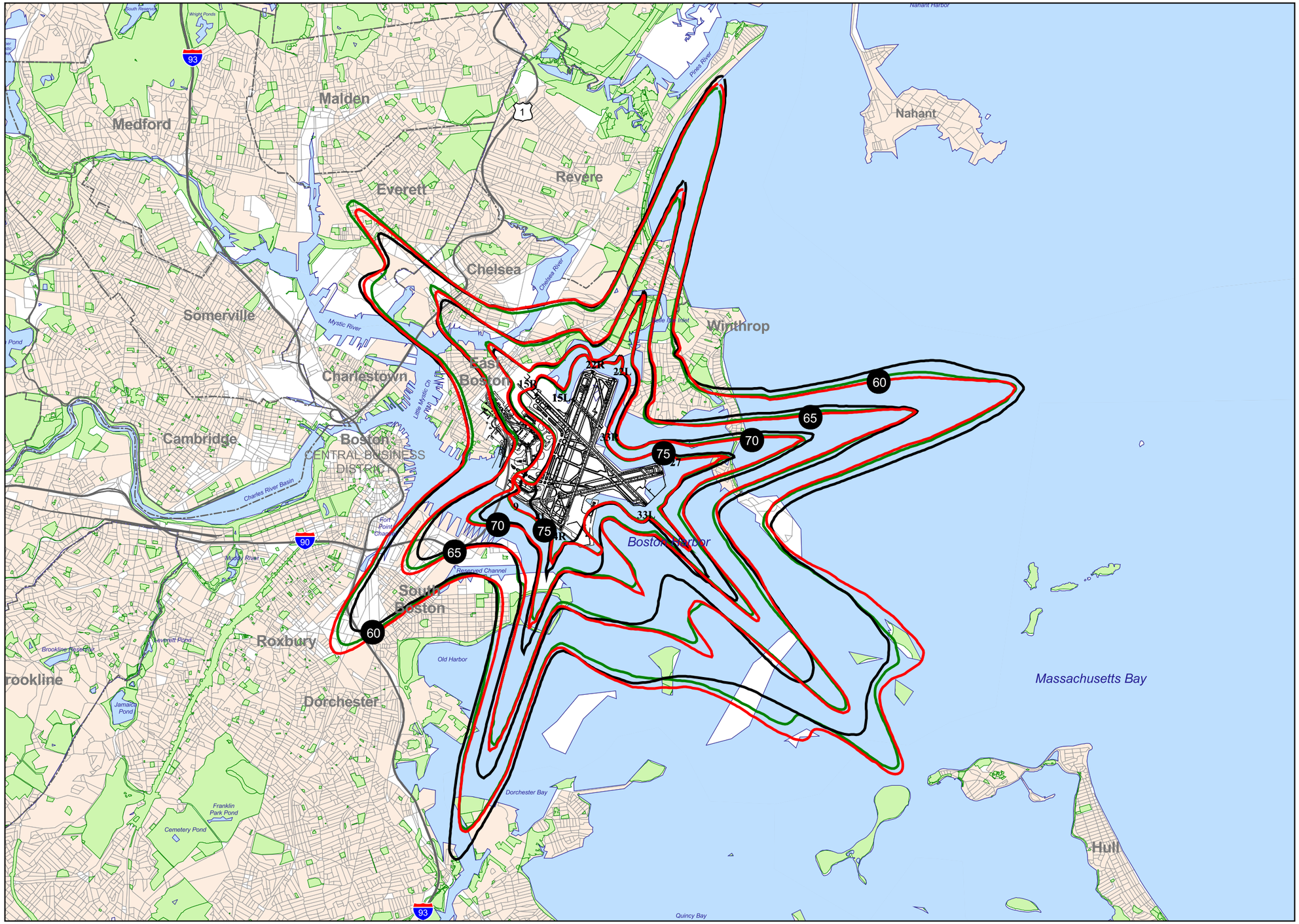
3.8.4.1 Cumulative Noise Exposure Contours

Figures 3.8-9 through 3.8-12 present the noise contours for the 5-, 10-, 15-, and 20-knot restrictions, respectively. Contours with the northwest wind restriction are compared to the No Action and unrestricted Preferred Alternative contours for values of 60, 65, 70, and 75 dB DNL.

Compared to an unrestricted Runway 14/32, a northwest wind restriction will limit the increase in departures from Runways 27 and 33L, thereby reducing overflights of South Boston (Andrews Square) and Roxbury by Runway 27 departures and of Chelsea and Everett by Runway 33L departures. As discussed in the previous sections, a northwest wind restriction can effectively limit these operations and their associated noise impacts by shifting aircraft to other runways. A restriction reduces the noise impacts of 27 departures, 33L departures, 4R departures, 22L departures, and 27 arrivals. This reduces noise levels in sections of Chelsea, East Boston, Everett, Revere, Roxbury, and South Boston. At the same time, a northwest wind restriction will increase the use of Runways 15R, 4L, and 4R for arrivals and Runways 9 and 22R for departures over what would be expected with an unrestricted Runway 14/32. Other areas of Chelsea, Everett, and South Boston and the communities of East Boston and Winthrop are overflown by these arrivals and departures.

There are also tradeoffs involving the day/night use of specific runways because PRAS is trying to achieve long-term runway use targets for equivalent jet operations while providing short-term relief from continual overflights of individual communities. Massport, with support from the FAA, has committed to begin working with the CAC to reassess the PRAS program as part of its Section 61 Findings (see Section 4.2 of this Final EIS).

that represented the most recent trends at Logan, particularly the recent growth in regional jets. In general, the impacts of a restriction with the 37.5M High RJ fleet were similar to the impacts with the 29M Low fleet.



Legend

No Action Alternative
60, 65, 70 and 75 DNL

Unrestricted
Preferred Alternative (ALT1-A)
60, 65, 70 and 75 DNL

Preferred Alternative
with a 5-Knot Restriction
60, 65, 70 and 75 DNL

Open Space

Census Blocks
Populated
Non-Populated

N

0 0.4 0.8 1.2 Miles

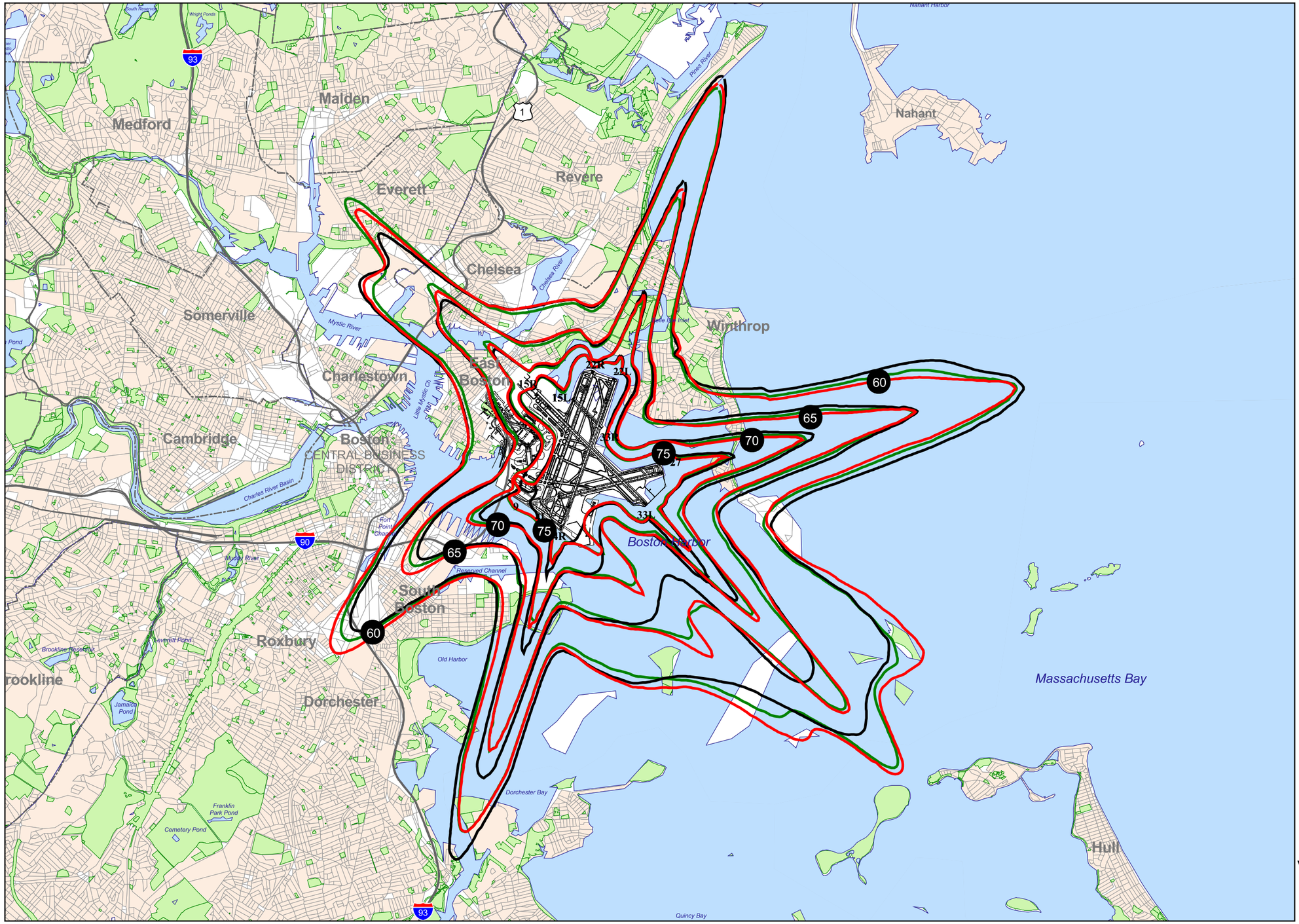
massport

Figure 3.8-9

Day/Night Sound Levels
29M Low Fleet DNL Contours
No Action vs. Unrestricted Preferred Alternative
vs. Preferred Alternative with a 5-Knot Restriction
60, 65, 70 and 75 dB DNL

Source: Harris Miller Miller & Hanson

THIS PAGE INTENTIONALLY LEFT BLANK



Legend

No Action Alternative
60, 65, 70 and 75 DNL

Unrestricted
Preferred Alternative (ALT1-A)
60, 65, 70 and 75 DNL

Preferred Alternative
with a 10-Knot Restriction
60, 65, 70 and 75 DNL

Open Space

Census Blocks
Populated
Non-Populated

N

0 0.4 0.8 1.2 Miles

Figure 3.8-10

Day/Night Sound Levels
29M Low Fleet DNL Contours
No Action vs. Unrestricted Preferred Alternative
vs. Preferred Alternative with a 10-Knot Restriction
60, 65, 70 and 75 dB DNL

Source: Harris Miller Miller & Hanson

THIS PAGE INTENTIONALLY LEFT BLANK

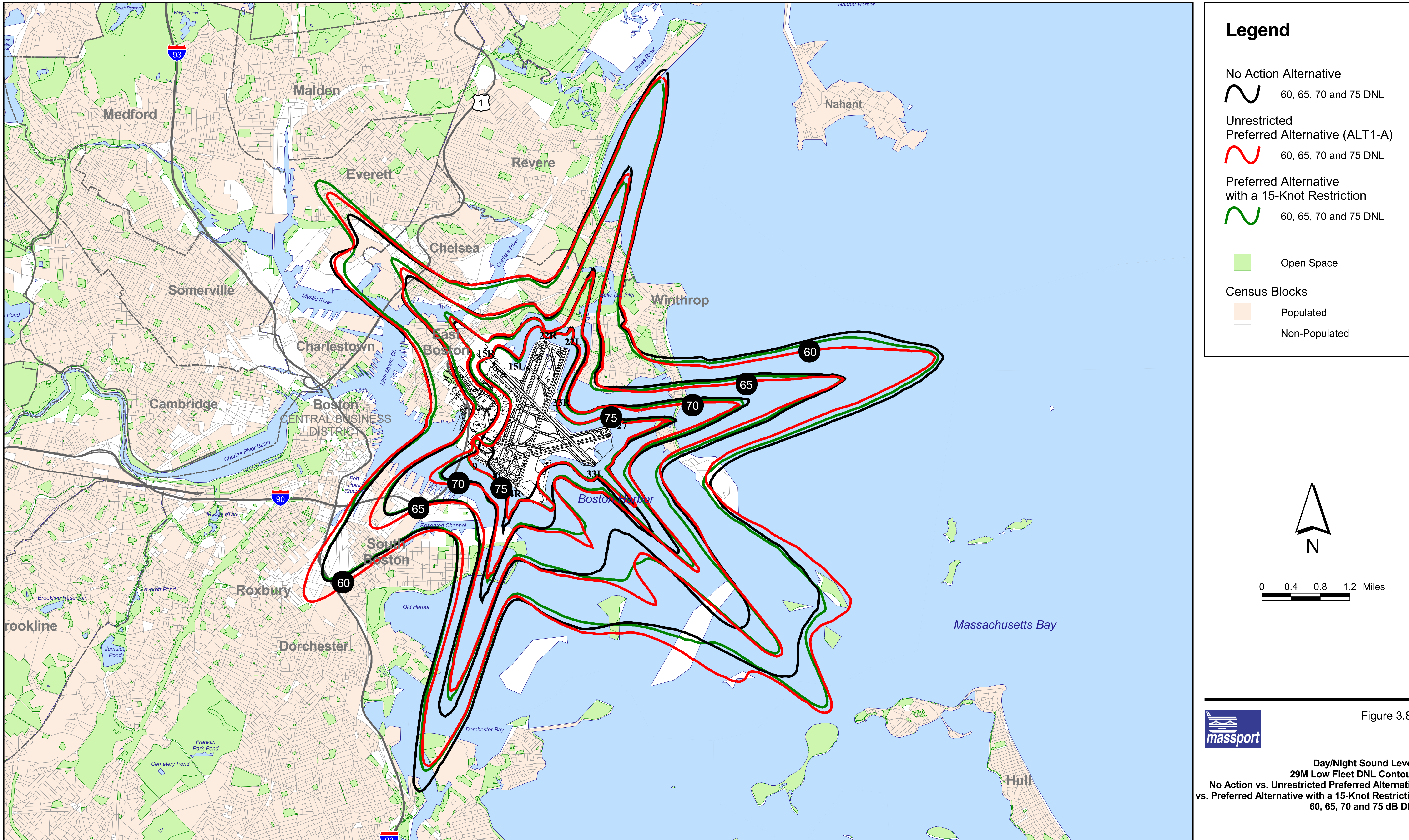
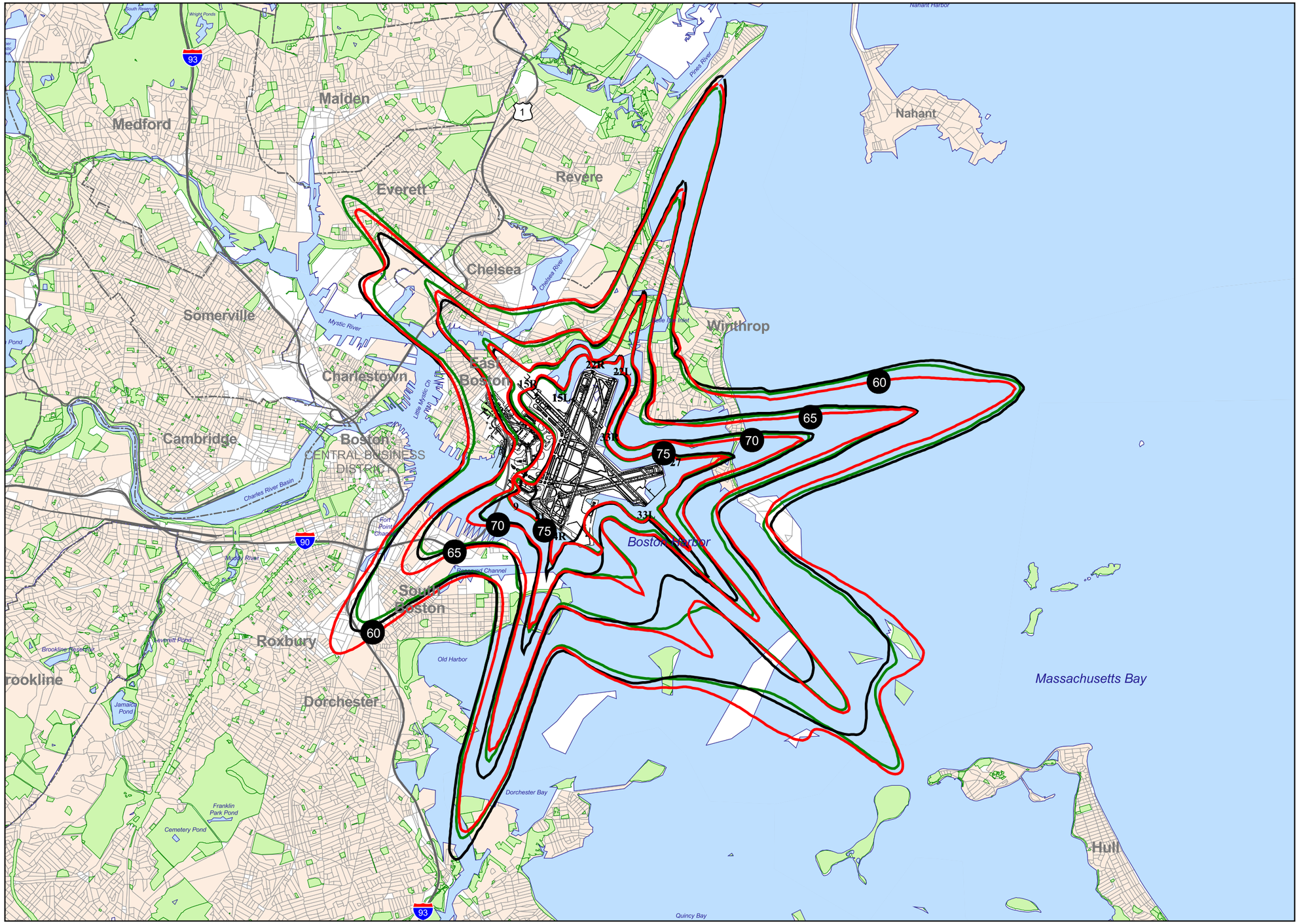


Figure 3.8-11

Day/Night Sound Levels
29M Low Fleet DNL Contours
No Action vs. Unrestricted Preferred Alternative
vs. Preferred Alternative with a 15-Knot Restriction
60, 65, 70 and 75 dB DNL

Source: Harris Miller Miller & Hanson

THIS PAGE INTENTIONALLY LEFT BLANK



Legend

No Action Alternative
60, 65, 70 and 75 DNL

Unrestricted
Preferred Alternative (ALT1-A)
60, 65, 70 and 75 DNL

Preferred Alternative
with a 20-Knot Restriction
60, 65, 70 and 75 DNL

Open Space

Census Blocks
Populated
Non-Populated

N

0 0.4 0.8 1.2 Miles

Figure 3.8-12

Day/Night Sound Levels
29M Low Fleet DNL Contours
No Action vs. Unrestricted Preferred Alternative
vs. Preferred Alternative with a 20-Knot Restriction
60, 65, 70 and 75 dB DNL

Source: Harris Miller Miller & Hanson

THIS PAGE INTENTIONALLY LEFT BLANK

3.8.4.2 Cumulative Noise Exposed Population

Table 3.8-1 presents the impacts of the various northwest wind restrictions on the estimated population within the 60, 65, 70, and 75 dB DNL contours. FAA considers residential land use incompatible with noise levels of 65 dB DNL and above; however, populations that experience noise levels between 60 and 65 dB DNL are presented to provide a more complete understanding of the total noise environment at lower noise levels.

Table 3.8-1
Total Noise Exposed Population with Various Northwest Wind Restrictions - 29M Low Fleet Scenario

			Pref. Alt. w/ NW Wind Restriction				Change Relative to No Action				
DNL	No Action	Pref. Alt.	5-kt	10-kt	15-kt	20-kt	Pref. Alt.	5-kt	10-kt	15-kt	20-kt
75 dB and above	122	2	2	45	45	82	(120)	(120)	(77)	(77)	(40)
70 dB and above	1,612	1,381	1,322	1,322	1,222	1,277	(231)	(290)	(290)	(390)	(335)
65 dB and above	18,960	18,562	17,268	17,168	16,943	16,946	(398)	(1,692)	(1,792)	(2,017)	(2,014)
60 dB and above	68,171	71,080	68,929	68,669	66,874	67,072	2,909	758	498	(1,297)	(1,099)

Compared to the No Action Alternative, the unrestricted Preferred Alternative decreases noise in the areas most significantly impacted (those above 65, 70, and 75 dB DNL), while increasing noise in areas of less impact (those above 60 dB DNL). With any northwest wind restriction, the total number of people exposed to noise at 65 dB DNL and above (the level at which noise is incompatible with residential use under Federal guidelines) decreases. If no action were taken to build a new runway to alleviate delays at Logan, 18,960 people would be exposed at 65 dB DNL and above. If Runway 14/32 is built and operated with no wind restriction, 18,562 people would be exposed at 65 dB DNL and above. This exposed population would decrease to 17,268 individuals if Runway 32 could only be used when northwest winds are 5-knots or greater. With a 10-knot restriction, the total number of individuals exposed to the noise at or above 65 dB DNL would be 17,168. Thus, a 10-knot restriction would eliminate 1,792 individuals from these higher noise contours as compared to the No Action Alternative. Compared to an unrestricted Runway 14/32, a 10-knot northwest wind restriction would remove 1,394 individuals from the 65 dB DNL contour. The number of individuals exposed to noise of 65 dB DNL and above would decline to 16,946 for a 20-knot northwest wind restriction, a reduction of 2,104 individuals as compared to the No Action Alternative. This same trend applies to individuals exposed at 70 dB DNL and above (see Table 3.8-1).

For all wind speed restrictions, the number of people within the highest noise contour, 75 dB DNL and above, would decline compared to the No Action Alternative. For example, Table 3.8-1 shows that 122 individuals are exposed at 75 dB DNL or greater under the No Action scenario, but only 45 individuals would be exposed to this noise level with a 10-knot restriction. If a northwest wind restriction of 10 knots or greater is added, the number of people within the 75 dB DNL contour would increase slightly compared to the

unrestricted Preferred Alternative. There are 2 individuals within the 75 dB DNL contour with no wind restriction, and there would be 45 individuals with a 10-knot wind restriction.

The number of individuals within the lowest 60 dB DNL noise contour would increase for a 5-knot and 10-knot restriction as compared to the No Action scenario. The number of individuals would begin to decrease for a 15-knot and 20-knot restriction as compared to the No Action Alternative. With any wind speed restriction on Runway 32, there would be fewer individuals within the 60 dB DNL contour than in the unrestricted case.

The noise-exposed population is described by community in Table 3.8-2, while the housing units exposed to each noise level are presented by community in Table 3.8-3. Since the changes in housing units mirror the population changes, the discussion will focus on the noise exposed population, and on those communities that are most impacted by the northwest wind restriction.

Chelsea & Everett

Chelsea and Everett are impacted by 33L departures and 15R arrivals. With an unrestricted Runway 14/32, the Chelsea population within the 65 dB DNL contour increases by 401 people relative to the No Action Alternative, while the population within the 60 dB DNL contour in Everett increases by 1,637 people. These increases are related to the increased use of the northwest (Runways 33L/32 & 27) and southeast (Runways 15L/14 & 9) three-runway configurations using Runway 14/32. The projected increase in noise levels is 0.6 dB DNL or less in those areas newly included in the Chelsea 65 dB DNL contour with the unrestricted Preferred Alternative.

As the wind speed threshold associated with the restriction increases, the availability of the northwest three-runway configuration with Runway 32 declines. To compensate for this decline, however, the PRAS program at Logan would try to reduce dependence upon the north/south runways by operating to the southeast with departures on Runway 14 during periods of low demand that occur in the early morning and late evening nighttime hours (between 10pm and 7am). Since departures from Runway 14 are used along with arrivals on Runway 15R (and departures on Runways 15R and 9), this results in an increase in nighttime 15R arrivals that would overfly Chelsea and Everett.[27] The benefits of the reductions in 33L departures with the restriction would be offset by this increase in nighttime 15R arrivals, which is a consequence of the northwest wind restriction and the PRAS program at Logan.

In Chelsea, adding a 5-knot restriction would reduce 33L departures, removing 72 people from the 65 DNL contour and 378 people from the 60 dB DNL contour compared to the unrestricted case. As the restriction increases to 10 knots and above, PRAS would increase nighttime 15R arrivals, and the population within the 65 dB DNL contour would increase by 124 relative to the unrestricted case. As compared to the No-Action Alternative, 329

27 See Section 3.8.5, which discusses a northwest/southeast wind restriction as a mechanism to mitigate this increase in 15R nighttime arrivals.

people are added to the 65 dB DNL contour in Chelsea with a 5-knot wind restriction, and 525 people are added to the 65 dB DNL contour in Chelsea with a 10-knot wind restriction. The noise impacts within the 65 dB DNL contour increase as the wind speed restriction increases, and nighttime 15R arrivals continue to climb.

FAA Order 1050.1D entitled *Policies and Procedures for Considering Environmental Impacts* and FAA Order 5050.4A entitled *Airport Environmental Handbook* indicate that changes in DNL of 1.5 dB or greater over sensitive land uses are significant when DNL values are greater than 65 dB. If populated areas above 65 dB DNL are subjected to project-related noise increases of 1.5 dB or greater, then areas within the 60 dB DNL contours are also examined to assess whether other residential areas are impacted by project-related noise changes of 3.0 dB or more.[28] In Chelsea, a wind restriction of 15-knots or greater would increase noise levels by 1.5 dB relative to the No Action scenario. This means that a restriction of 15 knots or greater would result in a significant adverse noise impact in Chelsea as defined by FAA Orders implementing NEPA. There are no other communities that would experience significant adverse impacts with either a northwest wind restriction or the unrestricted Preferred Alternative.

In Everett, the noise impacts in the 60 dB DNL contour would increase because as departures on 33L are reduced, the PRAS program acts to balance this by increasing nighttime arrivals on 15R. The population within the 60 dB DNL contour increases by 1,308 people with a 5-knot restriction relative to the unrestricted case. The impacted population increases by 2,194 people with a restriction of 10-knots or greater. The population within the 60 dB DNL contours increases with a northwest wind restriction, but the noise levels in Everett do not increase significantly as defined by FAA Orders implementing NEPA.

28 This information is used to consider potential mitigation measures, such as noise abatement flight procedures.

Table 3.8-2
Noise Exposed Population by Town or Neighborhood with Various Northwest Wind Restrictions - 29M Low Fleet Scenario

				Pref. Alt. w/ NW Wind Restriction				Change Relative to No Action				
Community	**DNL**	**No Action**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**
Chelsea	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	2,901	3,302	3,230	3,426	3,426	3,426	401	329	525	525	525
	60 dB and above	12,047	12,047	11,669	11,669	11,276	11,669	-	(378)	(378)	(771)	(378)
Dorchester	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	136	-	-	-	-	-	(136)	(136)	(136)	(136)	(136)
East Boston - Orient Heights	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	257	164	164	164	164	164	(93)	(93)	(93)	(93)	(93)
	65 dB and above	585	715	569	569	569	578	130	(16)	(16)	(16)	(7)
	60 dB and above	4,304	4,597	3,983	3,959	3,959	3,959	293	(321)	(345)	(345)	(345)
East Boston - Eagle Hill	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	335	335	335	335	335	335	-	-	-	-	-
	65 dB and above	5,864	5,112	4,910	4,910	4,910	4,910	(752)	(954)	(954)	(954)	(954)
	60 dB and above	17,048	17,048	16,470	16,470	16,210	16,210	-	(578)	(578)	(838)	(838)
East Boston - Jeffries Point	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	2,343	2,343	2,070	2,070	1,725	1,725	-	(273)	(273)	(618)	(618)
East Boston - Other	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	2,373	2,373	1,974	1,662	1,662	1,662	-	(399)	(711)	(711)	(711)
	60 dB and above	6,462	6,784	5,581	5,465	5,322	5,322	322	(881)	(997)	(1,140)	(1,140)
Total East Boston	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	592	499	499	499	499	499	(93)	(93)	(93)	(93)	(93)
	65 dB and above	8,822	8,200	7,453	7,141	7,141	7,150	(622)	(1,369)	(1,681)	(1,681)	(1,672)
	60 dB and above	30,157	30,772	28,104	27,964	27,216	27,216	615	(2,053)	(2,193)	(2,941)	(2,941)
Everett	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	319	1,956	3,264	4,150	4,150	4,150	1,637	2,945	3,831	3,831	3,831
Quincy	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	610	610	610	610	610	610	-	-	-	-	-
Revere	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	3,074	2,994	2,994	2,994	2,861	2,861	(80)	(80)	(80)	(213)	(213)
	60 dB and above	6,147	5,890	5,513	5,513	5,513	5,603	(257)	(634)	(634)	(634)	(544)
Roxbury	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	-	1,565	1,549	-	-	-	1,565	1,549	-	-	-

Table 3.8-2 (*continued*)
Noise Exposed Population by Town or Neighborhood with Various Northwest Wind Restrictions - 29M Low Fleet Scenario

				Pref. Alt. w/ NW Wind Restriction				Change Relative to No Action				
Community	**DNL**	**No Action**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**
South Boston	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	61	-	-	-	-	61	-	-	-	-
	60 dB and above	7,358	7,110	7,383	7,912	7,081	6,796	(248)	25	554	(277)	(562)
Winthrop - Court Rd	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	100	279	100	100	-	-	179	-	-	(100)	(100)
	65 dB and above	1,486	1,618	1,442	1,442	1,318	1,312	132	(44)	(44)	(168)	(174)
	60 dB and above	3,191	3,191	3,191	3,191	3,191	3,191	-	-	-	-	-
Winthrop - Other	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	761	824	469	469	469	469	63	(292)	(292)	(292)	(292)
	60 dB and above	5,139	5,225	4,932	4,932	4,932	4,932	86	(207)	(207)	(207)	(207)
Winthrop - Point Shirley	75 dB and above	122	2	2	45	45	82	(120)	(120)	(77)	(77)	(40)
	70 dB and above	920	603	723	723	723	778	(317)	(197)	(197)	(197)	(142)
	65 dB and above	1,916	1,563	1,680	1,696	1,728	1,728	(353)	(236)	(220)	(188)	(188)
	60 dB and above	3,067	2,714	2,714	2,728	2,905	2,905	(353)	(353)	(339)	(162)	(162)
Total Winthrop	75 dB and above	122	2	2	45	45	82	(120)	(120)	(77)	(77)	(40)
	70 dB and above	1,020	882	823	823	723	778	(138)	(197)	(197)	(297)	(242)
	65 dB and above	4,163	4,005	3,591	3,607	3,515	3,509	(158)	(572)	(556)	(648)	(654)
	60 dB and above	11,397	11,130	10,837	10,851	11,028	11,028	(267)	(560)	(546)	(369)	(369)
Total - All Communities	75 dB and above	122	2	2	45	45	82	(120)	(120)	(77)	(77)	(40)
	70 dB and above	1,612	1,381	1,322	1,322	1,222	1,277	(231)	(290)	(290)	(390)	(335)
	65 dB and above	18,960	18,562	17,268	17,168	16,943	16,946	(398)	(1,692)	(1,792)	(2,017)	(2,014)
	60 dB and above	68,171	71,080	68,929	68,669	66,874	67,072	2,909	758	498	(1,297)	(1,099)

South Boston & Roxbury

The Andrews Square section of South Boston is impacted by Runway 27 departures, so the unrestricted Runway 14/32 adds 61 people to the 65 dB DNL contour relative to the No Action Alternative. Roxbury is also impacted by Runway 27 departures, and the unrestricted Runway 14/32 adds 1,565 people within the 60 dB DNL. The 60 dB DNL contour associated with 4R arrivals impacts the Farragut Road section of South Boston and the Castle Island area. Thus, the unrestricted Runway 14/32 results in decreased reliance on 4R arrivals and a corresponding decline of 248 people in the Farragut Road section of the South Boston 60 dB DNL contour compared to the No Action Alternative.

Table 3.8-3
Noise Exposed Housing Units by Town or Neighborhood with Various Northwest Wind Restrictions - 29M Low Fleet Scenario

				Pref. Alt. w/ NW Wind Restriction				Change Relative to No Action				
Community	**DNL**	**No Action**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**
Chelsea	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	1,051	1,193	1,132	1,180	1,180	1,180	142	81	129	129	129
	60 dB and above	4,359	4,359	4,185	4,185	4,067	4,185	-	(174)	(174)	(292)	(174)
Dorchester	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	54	-	-	-	-	-	(54)	(54)	(54)	(54)	(54)
East Boston -	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
Orient Heights	70 dB and above	111	76	76	76	76	76	(35)	(35)	(35)	(35)	(35)
	65 dB and above	271	336	260	260	260	266	65	(11)	(11)	(11)	(5)
	60 dB and above	1,851	1,894	1,719	1,709	1,709	1,709	43	(132)	(142)	(142)	(142)
East Boston -	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
Eagle Hill	70 dB and above	130	130	130	130	130	130	-	-	-	-	-
	65 dB and above	2,158	1,886	1,805	1,805	1,805	1,805	(272)	(353)	(353)	(353)	(353)
	60 dB and above	6,323	6,323	6,095	6,095	5,988	5,988	-	(228)	(228)	(335)	(335)
East Boston -	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
Jeffries Point	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	1,093	1,093	950	950	802	802	-	(143)	(143)	(291)	(291)
East Boston -	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
Other	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	1,060	1,060	845	718	718	718	-	(215)	(342)	(342)	(342)
	60 dB and above	2,659	2,811	2,329	2,278	2,225	2,225	152	(330)	(381)	(434)	(434)
Total East	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
Boston	70 dB and above	241	206	206	206	206	206	(35)	(35)	(35)	(35)	(35)
	65 dB and above	3,489	3,282	2,910	2,783	2,783	2,789	(207)	(579)	(706)	(706)	(700)
	60 dB and above	11,926	12,121	11,093	11,032	10,724	10,724	195	(833)	(894)	(1,202)	(1,202)
Everett	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	135	833	1,406	1,757	1,757	1,757	698	1,271	1,622	1,622	1,622
Quincy	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	426	426	426	426	426	426	-	-	-	-	-
Revere	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	1,410	1,363	1,363	1,363	1,304	1,304	(47)	(47)	(47)	(106)	(106)
	60 dB and above	2,756	2,662	2,516	2,516	2,516	2,546	(94)	(240)	(240)	(240)	(210)
Roxbury	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-	-	-	-	-
	60 dB and above	-	14	-	-	-	-	14	-	-	-	-

Table 3.8-3 (*continued*)
Noise Exposed Housing Units by Town or Neighborhood with Various Northwest Wind Restrictions - 29M Low Fleet Scenario

				Pref. Alt. w/ NW Wind Restriction				Change Relative to No Action				
Community	**DNL**	**No Action**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**	**Pref. Alt.**	**5-kt**	**10-kt**	**15-kt**	**20-kt**
South Boston	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	-	42	-	-	-	-	42	-	-	-	-
	60 dB and above	3,595	3,431	3,594	3,866	3,463	3,331	(164)	(1)	271	(132)	(264)
Winthrop - Court Rd	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	38	107	38	38	-	-	69	-	-	(38)	(38)
	65 dB and above	563	614	547	547	491	488	51	(16)	(16)	(72)	(75)
	60 dB and above	1,208	1,208	1,208	1,208	1,208	1,208	-	-	-	-	-
Winthrop - Other	75 dB and above	-	-	-	-	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-	-	-	-	-
	65 dB and above	273	300	163	163	163	163	27	(110)	(110)	(110)	(110)
	60 dB and above	2,100	2,133	1,995	1,995	1,995	1,995	33	(105)	(105)	(105)	(105)
Winthrop - Point Shirley	75 dB and above	57	2	2	22	22	36	(55)	(55)	(35)	(35)	(21)
	70 dB and above	433	283	344	344	344	373	(150)	(89)	(89)	(89)	(60)
	65 dB and above	869	710	752	761	779	779	(159)	(117)	(108)	(90)	(90)
	60 dB and above	1,426	1,250	1,250	1,256	1,353	1,353	(176)	(176)	(170)	(73)	(73)
Total Winthrop	75 dB and above	57	2	2	22	22	36	(55)	(55)	(35)	(35)	(21)
	70 dB and above	471	390	382	382	344	373	(81)	(89)	(89)	(127)	(98)
	65 dB and above	1,705	1,624	1,462	1,471	1,433	1,430	(81)	(243)	(234)	(272)	(275)
	60 dB and above	4,734	4,591	4,453	4,459	4,556	4,556	(143)	(281)	(275)	(178)	(178)
Total - All Communities	75 dB and above	57	2	2	22	22	36	(55)	(55)	(35)	(35)	(21)
	70 dB and above	712	596	588	588	550	579	(116)	(124)	(124)	(162)	(133)
	65 dB and above	7,655	7,504	6,867	6,797	6,700	6,703	(151)	(788)	(858)	(955)	(952)
	60 dB and above	27,985	28,437	27,673	28,241	27,509	27,525	452	(312)	256	(476)	(460)

As intended, the northwest wind restriction on Runway 32 would reduce the number of departures from Runway 27, thereby reducing impacts in the Andrews Square section of South Boston and in Roxbury. A 5-knot restriction would completely remove the South Boston residents from the 65 dB DNL contour and remove 16 people from the Roxbury 60 dB DNL contour. A restriction of 10-knots or greater would eliminate all of the remaining 1,549 Roxbury residents within the 60 dB DNL contour.

Since the 60 dB DNL contour in South Boston is impacted by 27 departures (Andrews Square) and 4R arrivals (Farragut Road and Castle Island), the number of South Boston residents within the 60 dB DNL contour would fluctuate as the wind speed associated with the northwest wind restriction is increased. The population impacts within the 60 DNL contour increase initially (with 4R arrivals) and then fall off (with 27 departures) as the restriction is increased.

East Boston, Winthrop, and Revere

Because East Boston, Winthrop, and Revere are impacted by the use of the north/south three-runway configurations, they are the most heavily noise impacted communities under the No Action Alternative. The unrestricted Runway 14/32 would reduce noise exposure in these communities, reducing the number of people within the 65, 70, and 75 dB DNL contours. With a northwest wind restriction, population impacts would continue to decline in most neighborhoods within these communities. However, the Point Shirley area of Winthrop, which is the only neighborhood with residents exposed to noise levels of 75 dB DNL and above, would experience increased noise levels relative to the unrestricted Preferred Alternative. This is due to increased use of Runway 9 departures, which would cause noise levels to increase towards those associated with the No Action scenario. With a 10-knot restriction, 43 people would be added to the 75 dB DNL contour in Point Shirley relative to the unrestricted Preferred Alternative. With a 20-knot restriction, 80 people would be added relative to the unrestricted Preferred Alternative. Compared to the No Action Alternative, noise impacts in Point Shirley decrease within the 60, 65, 70, and 75 dB DNL for all wind restriction cases

3.8.5 Summary of the Northwest Wind Restriction Analysis

The analysis of the operational and environmental impacts of a range of potential northwest wind restrictions has resulted in a number of key findings:

- In terms of delay reduction, an unrestricted Runway 32 provides the greatest delay reduction benefit. However, northwest wind restrictions from 5 to 20 knots maintain most of the delay reduction benefits of the unrestricted runway, substantially reducing delays during northwest winds.
- With regard to runway utilization, the 10-knot northwest wind restriction most closely maintains historical runway use shares. With a 10-knot northwest wind restriction, the shares of jet departures from Runways 27 and 33L are comparable to the shares in CY 2000, eliminating the increased overflights to the west and northwest that are predicted under the unrestricted scenario. With a northwest wind restriction of 15-knots or higher, Runways 27 and 33L departures shares drop below CY 2000 levels, but this reduction comes at the expense of increased use of the north/south runways. In general, the 10-knot northwest wind restriction maintains the historical status quo, eliminating the major shifts in Runway 27 and 33L departures that could occur with an unrestricted Runway 14/32. Compared to the No Action Alternative, with a 10-knot northwest wind restriction over-the-water arrivals increase, PRAS performance improves, and north/south runway use declines, but not to the extent predicted with an unrestricted Runway 14/32.
- When noise impacts are considered, any wind restriction on Runway 14/32 reduces the number of people exposed to noise levels of 65 dB DNL and above when compared to both the No Action and unrestricted Preferred Alternative. As the wind speed threshold is increased, there are increased noise impacts in areas of Chelsea and Everett due to increased nighttime arrivals on Runway 15R that are a consequence of the interactions between PRAS and the northwest wind restriction.

Overall, a 10-knot northwest wind restriction strikes a balance between delay savings and increased departures on Runways 27 and 33L. It maintains the status quo in terms of Runway 27 and 33L jet departure utilization, while retaining most of the northwest wind delay reduction benefits associated with the unrestricted Runway 14/32. While the northwest wind restriction was designed to limit the predicted changes in runway utilization with an unrestricted Runway 14/32, the 10-knot northwest wind restriction is predicted to cause an increase in nighttime 15R arrivals. Potential mitigation of this increase is discussed in Section 3.8.6.

3.8.6 Analysis of a Northwest/Southeast Wind Restriction

While a 10-knot northwest wind restriction would maintain CY 2000 runway use shares for departures from Runways 27 and 33L, it would also result in increased nighttime use of the southeast runway configuration using Runway 14 for departures. As the availability of Runway 32 declines with increasing wind speed thresholds, PRAS would seek to reduce dependence upon the north/south runways by operating to the southeast with departures on Runway 14 during periods of low demand that occur in the early morning and late evening nighttime hours (see Section 3.8.4.2). Runway 14 departures are used in combination with 15R arrivals, resulting in increased nighttime 15R arrivals compared to the unrestricted scenario. These nighttime 15R arrivals overfly Chelsea and Everett, resulting in increased noise impacts over these communities. Given that this increase in 15R nighttime arrivals is a consequence of the interactions between PRAS and the northwest wind restriction, which was actually designed to limit changes in runway utilization due to Runway 14/32, it is necessary to consider additional measures to mitigate this increased use of 15R arrivals.

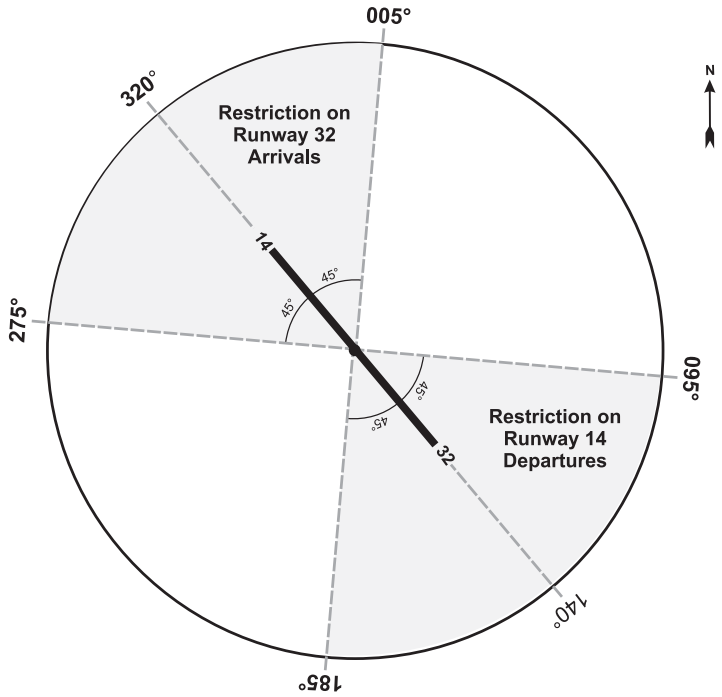
Just as a northwest wind restriction would limit the redistribution of flights due to the unrestricted availability of Runway 32 for arrivals, a southeast wind restriction can similarly prevent a redistribution of overflights due to the availability of Runway 14 for departures. While Runway 14 would be used much less than Runway 32 and has limited delay reduction utility, its unrestricted availability would produce changes in runway utilization due to PRAS, and its nighttime use would cause noise impacts in those communities impacted by 15R arrivals. As with the northwest wind restriction, a southeast wind restriction can limit these changes in runway utilization. The following sections describe the analysis of a northwest/southeast wind restriction on the use of Runway 14/32.

3.8.6.1 Methodology for the Northwest/Southeast Wind Restriction Analysis

The methodology and assumptions for the analysis of the northwest/southeast wind restriction are similar to those used for the analysis of the northwest wind restriction. Figure 3.8-13 shows that Runway 32 is available for arriving aircraft only when the wind direction is within the 90-degree northwest quadrant between 275° and 005° (i.e., 45 degrees on either side of the 320° runway heading). In addition, Runway 14 is available for departing aircraft only when the wind direction is within the 90-degree southeast quadrant between 095° and 185° (i.e. 45 degrees on either side of the 140° runway

heading). Since a 10-knot northwest wind restriction is predicted to result in runway use that is similar to historic runway utilization patterns, a 10-knot wind speed threshold was selected for analysis of the northwest/southeast wind restriction. As with the northwest wind restriction, the 37.5M High RJ scenario was used to evaluate the potential long-term operational impacts of the northwest/southeast wind restriction. The 29M Low fleet was used to examine the noise and other environmental impacts of the northwest/southeast restriction, because this scenario is the mitigation fleet for the sound insulation program and represents an upper bound on total noise exposure. The noise impacts of the 10-knot northwest/southeast wind restriction were also examined using the 37.5M High RJ fleet to provide an indication of the long-term impacts of the restriction (see Section 3.8.6.4).

Figure 3.8-13
Northwest/Southeast Quadrant Restriction

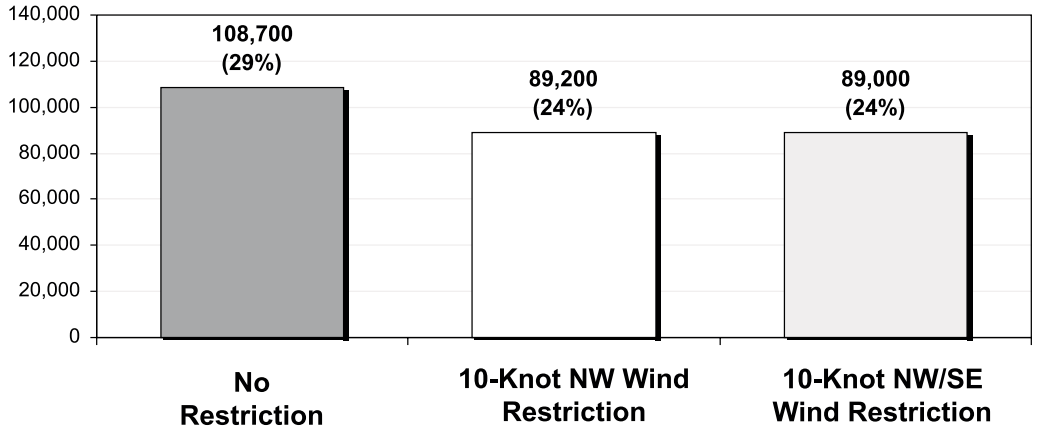


3.8.6.2 Delay Reduction with a Northwest/Southeast Restriction

Figure 3.8-14 shows the annual hours of delay reduction with a 10-knot northwest/southeast wind restriction. The three-runway configuration with Runway 14 (Runways 15R/14 & 9) has a lower capacity than the three-runway configuration with Runway 32 (Runways 33L/32 & 27), and it is used primarily during nighttime hours (10pm to 7am) and other periods of low demand. As a result, operating to the southeast provides little delay reduction benefit, and a 10-knot northwest/southeast restriction has almost no impact on delays compared to a 10-knot northwest wind restriction. With a northwest/southeast restriction, delay reduction is reduced by only 200 annual hours

relative to the one-way restriction, and delays are still reduced by 24 percent relative to the No Action Alternative.

Figure 3.8-14
Annual Hours of Delay Reduction – 2015 37.5M High RJ Fleet with a 10-Knot Northwest/Southeast Wind Restriction



3.8.6.3 Runway Utilization Patterns with a Northwest/Southeast Restriction

The northwest/southeast wind restriction is designed to prevent the changes in runway utilization that are predicted with construction of an unrestricted Runway 14/32. Thus, the northwest/southeast restriction should result in jet departures from Runways 27 and 33L that are very similar to CY 2000 shares, much like the one-way restriction on Runway 32 arrivals. In addition, by restricting Runway 14 departures, the northwest/southeast restriction should prevent the PRAS-induced increase in 15R nighttime arrival noise that was predicted with the northwest wind restriction. Table 3.8-4 compares the runway utilization shares for the northwest/southeast wind restriction to those for the No Action Alternative, the unrestricted Preferred Alternative, and the Preferred Alternative with a 10-knot northwest wind restriction.

The 10-knot northwest/southeast restriction results in a share of 15R nighttime jet arrivals that is equivalent to CY 2000 shares. This prevents the increased noise impacts in Chelsea, Everett, and East Boston (Eagle Hill) due to 15R nighttime arrivals, consistent with the objective of the southeast wind restriction on Runway 14 departures. Like the northwest wind restriction, the northwest/southeast restriction maintains the shares of Runways 27 and 33L jet departures at CY 2000 levels, preventing the shifts in runway use that were predicted with the unrestricted Runway 14/32. Similarly, runway use shares of the north/south runways and over-the-water arrivals are also very close to CY 2000 shares. With a 10-knot northwest/southeast restriction, PRAS performance relative to the annual goals is nearly identical to, but slightly below, the performance with the 10-knot one-way northwest wind restriction in place.

Table 3.8-4
Runway Utilization with a Northwest/Southeast Wind Restriction – 2015 37.5M High RJ Fleet Scenario

			Preferred Alternative		
	CY 2000	No Action	Unrestricted	10-knot NW Restriction	10-knot NW/SE Restriction
Rwy 15R Nighttime Jet Arrivals*	1.0%	0.7%	2.1%	3.3%	1.0%
Rwy 27 Jet Departures	15.0%	5.8%	29.2%	15.2%	15.4%
Rwy 33L Jet Departures	6.0%	2.0%	10.8%	5.6%	5.7%
Over-the-Water Arrivals	20.0%	10.0%	40.0%	22.0%	22.6%
North/South Runway Use	76.5%	89.8%	56.0%	75.8%	76.4%
PRAS Performance Index (PPI)	1,306	2,853	1,058	1,795	1,836

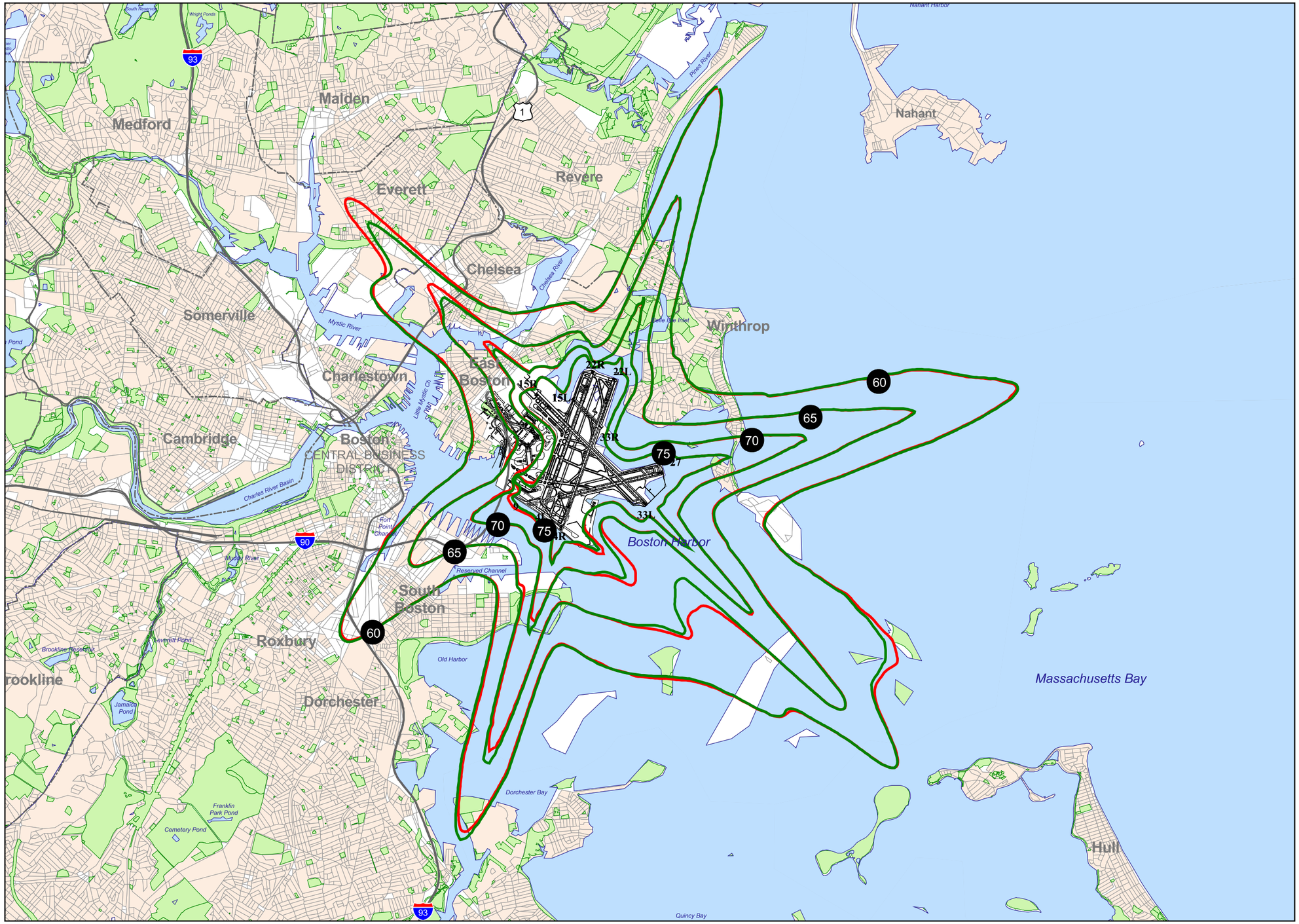
* Nighttime hours are from 10pm to 7am.

3.8.6.4 Noise Impacts with a Northwest/Southeast Restriction

Figures 3.8-15 and 3.8-16 present the noise contours for the 10-knot northwest/southeast restriction. The first figure compares the 10-knot northwest/southeast wind restriction with the 10-knot northwest wind restriction. The second figure compares the northwest/southeast restriction contour with the No Action and unrestricted Preferred Alternatives.

When comparing the northwest/southeast restriction with the one-way restriction, the main difference is that the northwest/southeast restriction mitigates the increased noise from nighttime use of the three-runway southeast configuration. As a result, the contour is smaller over Chelsea, Everett, and East Boston (Eagle Hill), as well as over the water on the Runway 14/15R departure end. The northwest/southeast contour is slightly larger under the north/south runway approach and departure paths, most noticeably under the 4R arrival track.

Table 3.8-5 presents the impacts of the northwest/southeast wind restriction on the total estimated population within the 60, 65, 70, and 75 dB DNL contours. The 10-knot northwest/southeast wind restriction on Runway 14/32 reduces the number of people within the 60, 65, 70, and 75 dB DNL contours when compared to the No Action Alternative. Compared to the unrestricted Preferred Alternative, the northwest/southeast restriction reduces the number of people within the 60, 65, and 70 dB DNL contours, but results in a small increase (43 additional people) within the 75 dB DNL contour due to increased use of Runway 9 departures over Point Shirley.



Legend

Alternative with a 10-Knot Northwest Wind Restriction

60, 65, 70 and 75 DNL

Alternative with a 10-Knot Northwest / Southeast Wind Restriction

60, 65, 70 and 75 DNL

Open Space

Census Blocks

Populated

Non-Populated

N

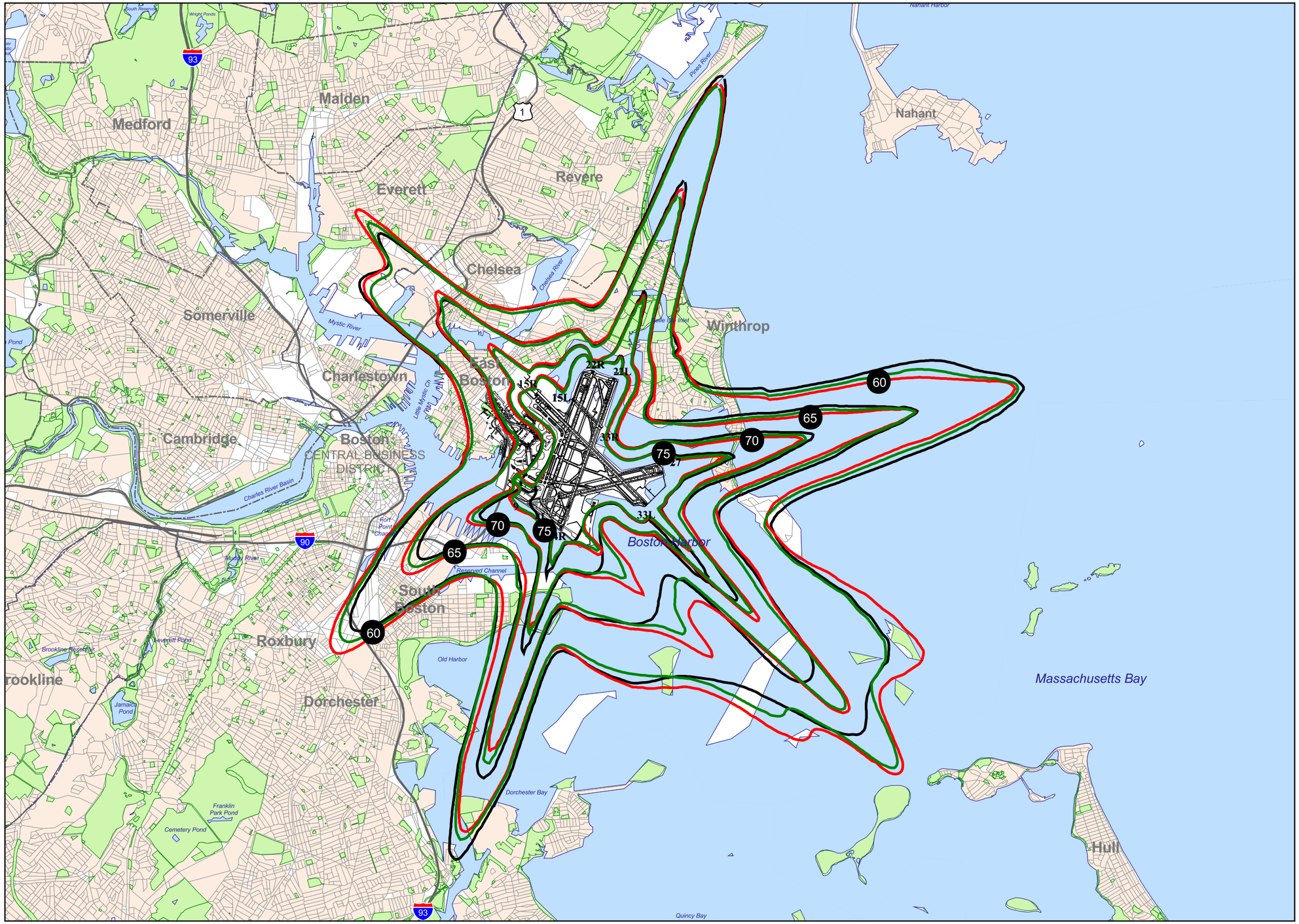
0 0.4 0.8 1.2 Miles

Figure 3.8-15

Day/Night Sound Levels
29M Low Fleet DNL Contours
10-Knot Northwest / Southeast Wind Restriction
vs. 10-Knot Northwest Restriction
60, 65, 70 and 75 dB DNL

Source: Harris Miller Miller & Hanson

THIS PAGE INTENTIONALLY LEFT BLANK



Legend

No Action Alternative
60, 65, 70 and 75 DNL

Unrestricted
Preferred Alternative (ALT1-A)
60, 65, 70 and 75 DNL

Preferred Alternative with a
10-Knot Northwest / Southeast
Wind Restriction
60, 65, 70 and 75 DNL

Open Space

Census Blocks
Populated
Non-Populated

N

0 0.4 0.8 1.2 Miles

Figure 3.8-16

Day/Night Sound Levels
29M Low Fleet DNL Contours
No Action vs. Unrestricted Preferred Alternative vs. Preferred Alternative with a 10-Knot Northwest/Southeast Wind Restriction
60, 65, 70 and 75 dB DNL

Source: Harris Miller Miller & Hanson

THIS PAGE INTENTIONALLY LEFT BLANK

Table 3.8-5
Total Noise Exposed Population with a 10-Knot Northwest/Southeast Wind Restriction – 29M Low Fleet Scenario

			10-Knot Restriction		Change Relative to No Action		
DNL	No Action	Pref. Alt.	NW	NW/SE	Pref. Alt.	NW	NW/SE
75 dB and above	122	2	45	45	(120)	(77)	(77)
70 dB and above	1,612	1,381	1,322	1,322	(231)	(290)	(290)
65 dB and above	18,960	18,562	17,168	16,935	(398)	(1,792)	(2,025)
60 dB and above	68,171	71,080	68,669	67,108	2,909	498	(1,063)

Table 3.8-6 presents the impacts of the northwest/southeast wind restriction on the total estimated population within the 60, 65, 70, and 75 dB DNL contours for the individual towns and neighborhoods surrounding Logan. Table 3.8-7 presents the noise-exposed housing unit information for the same scenarios.

When the impacts by town or neighborhood are considered, the 10-knot northwest/southeast wind restriction on Runway 14/32 results in the following key findings:

- Chelsea & Everett - In Chelsea, the northwest /southeast wind restriction reduces impacted population compared to the No Action Alternative, the unrestricted Preferred Alternative, and the Preferred Alternative with a 10-knot northwest wind restriction. This reduction is primarily due to the decline in 15R nighttime arrivals. In Everett, the northwest/southeast restriction similarly reduces population impacts compared to the unrestricted Preferred Alternative and the Preferred Alternative with a 10-knot northwest wind restriction, but not to the level experienced under the No Action scenario.
- South Boston & Roxbury – As with the northwest wind restriction, the 10-knot northwest/southeast restriction removes South Boston from the 65 dB DNL contour. The northwest/southeast restriction results in the same number of people in the 60 dB DNL contour in South Boston as the one-way restriction due to increased reliance on 4R arrivals compared to the unrestricted Preferred Alternative. In Roxbury, the number of people within the 60 dB DNL contour with the northwest/southeast restriction is in between the population counts associated with the No Action and unrestricted Preferred Alternatives.
- East Boston, Winthrop, and Revere – In Point Shirley, the numbers of people within the 60, 65, 70, and 75 dB DNL contours with a 10-knot northwest/southeast wind restriction are less than the numbers of people under the No Action Alternative, but greater than the numbers of people under the unrestricted Preferred Alternative. In all other sections of East Boston, Winthrop, and Revere, the 10-knot northwest/southeast restriction either maintains or reduces the population within the 60, 65, and 70 dB DNL contours compared to both the No Action Alternative and the unrestricted Preferred Alternative.

Table 3.8-6
Noise Exposed Population by Town or Neighborhood with a 10-Knot Northwest/Southeast Wind Restriction - 29M Low Fleet Scenario

				10-Knot Restriction		Change Relative to No Action		
Community	**DNL**	**No Action**	**Pref. Alt.**	**NW**	**NW/SE**	**Pref. Alt.**	**NW**	**NW/SE**
Chelsea	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	2,901	3,302	3,426	2,715	401	525	(186)
	60 dB and above	12,047	12,047	11,669	11,034	-	(378)	(1,013)
Dorchester	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	136	-	-	-	(136)	(136)	(136)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Orient Heights	70 dB and above	257	164	164	164	(93)	(93)	(93)
	65 dB and above	585	715	569	578	130	(16)	(7)
	60 dB and above	4,304	4,597	3,959	3,983	293	(345)	(321)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Eagle Hill	70 dB and above	335	335	335	335	-	-	-
	65 dB and above	5,864	5,112	4,910	4,910	(752)	(954)	(954)
	60 dB and above	17,048	17,048	16,470	16,470	-	(578)	(578)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Jeffries Point	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	2,343	2,343	2,070	2,070	-	(273)	(273)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Other	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	2,373	2,373	1,662	2,131	-	(711)	(242)
	60 dB and above	6,462	6,784	5,465	5,581	322	(997)	(881)
Total East	75 dB and above	-	-	-	-	-	-	-
Boston	70 dB and above	592	499	499	499	(93)	(93)	(93)
	65 dB and above	8,822	8,200	7,141	7,619	(622)	(1,681)	(1,203)
	60 dB and above	30,157	30,772	27,964	28,104	615	(2,193)	(2,053)
Everett	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	319	1,956	4,150	1,183	1,637	3,831	864
Quincy	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	610	610	610	610	-	-	-
Revere	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	3,074	2,994	2,994	2,994	(80)	(80)	(80)
	60 dB and above	6,147	5,890	5,513	5,688	(257)	(634)	(459)
Roxbury	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	-	1,565	-	1,549	1,565	-	1,549

Table 3.8-6 (*continued*)
Noise Exposed Population by Town or Neighborhood with a 10-Knot Northwest/Southeast Wind Restriction - 29M Low Fleet Scenario

				10-Knot Restriction		Change Relative to No Action		
Community	**DNL**	**No Action**	**Pref. Alt.**	**NW**	**NW/SE**	**Pref. Alt.**	**NW**	**NW/SE**
South Boston	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	61	-	-	61	-	-
	60 dB and above	7,358	7,110	7,912	7,912	(248)	554	554
Winthrop - Court Rd	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	100	279	100	100	179	-	-
	65 dB and above	1,486	1,618	1,442	1,442	132	(44)	(44)
	60 dB and above	3,191	3,191	3,191	3,191	-	-	-
Winthrop - Other	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	761	824	469	469	63	(292)	(292)
	60 dB and above	5,139	5,225	4,932	4,932	86	(207)	(207)
Winthrop - Point Shirley	75 dB and above	122	2	45	45	(120)	(77)	(77)
	70 dB and above	920	603	723	723	(317)	(197)	(197)
	65 dB and above	1,916	1,563	1,696	1,696	(353)	(220)	(220)
	60 dB and above	3,067	2,714	2,728	2,905	(353)	(339)	(162)
Total Winthrop	75 dB and above	122	2	45	45	(120)	(77)	(77)
	70 dB and above	1,020	882	823	823	(138)	(197)	(197)
	65 dB and above	4,163	4,005	3,607	3,607	(158)	(556)	(556)
	60 dB and above	11,397	11,130	10,851	11,028	(267)	(546)	(369)
Total - All Communities	75 dB and above	122	2	45	45	(120)	(77)	(77)
	70 dB and above	1,612	1,381	1,322	1,322	(231)	(290)	(290)
	65 dB and above	18,960	18,562	17,168	16,935	(398)	(1,792)	(2,025)
	60 dB and above	68,171	71,080	68,669	67,108	2,909	498	(1,063)

While the environmental impact analysis of the various wind restrictions has thus far focused on the near-term 29M Low scenario in order to provide a conservative estimate of noise impacts, the 10-knot northwest/southeast restriction was also examined using the 2015 37.5M High RJ scenario.

Figure 3.8-17 compares the noise contours with a 10-knot northwest/southeast restriction to those associated with the No Action and unrestricted Preferred Alternatives. The wind restriction contours are generally in between those associated with the No Action and unrestricted Preferred Alternatives. They are larger than the No Action contours in the west, northwest, and southeast. They are smaller than the No Action contours in the east, north, and south. The opposite is true when comparing the wind restriction contours to those of the unrestricted Preferred Alternative.

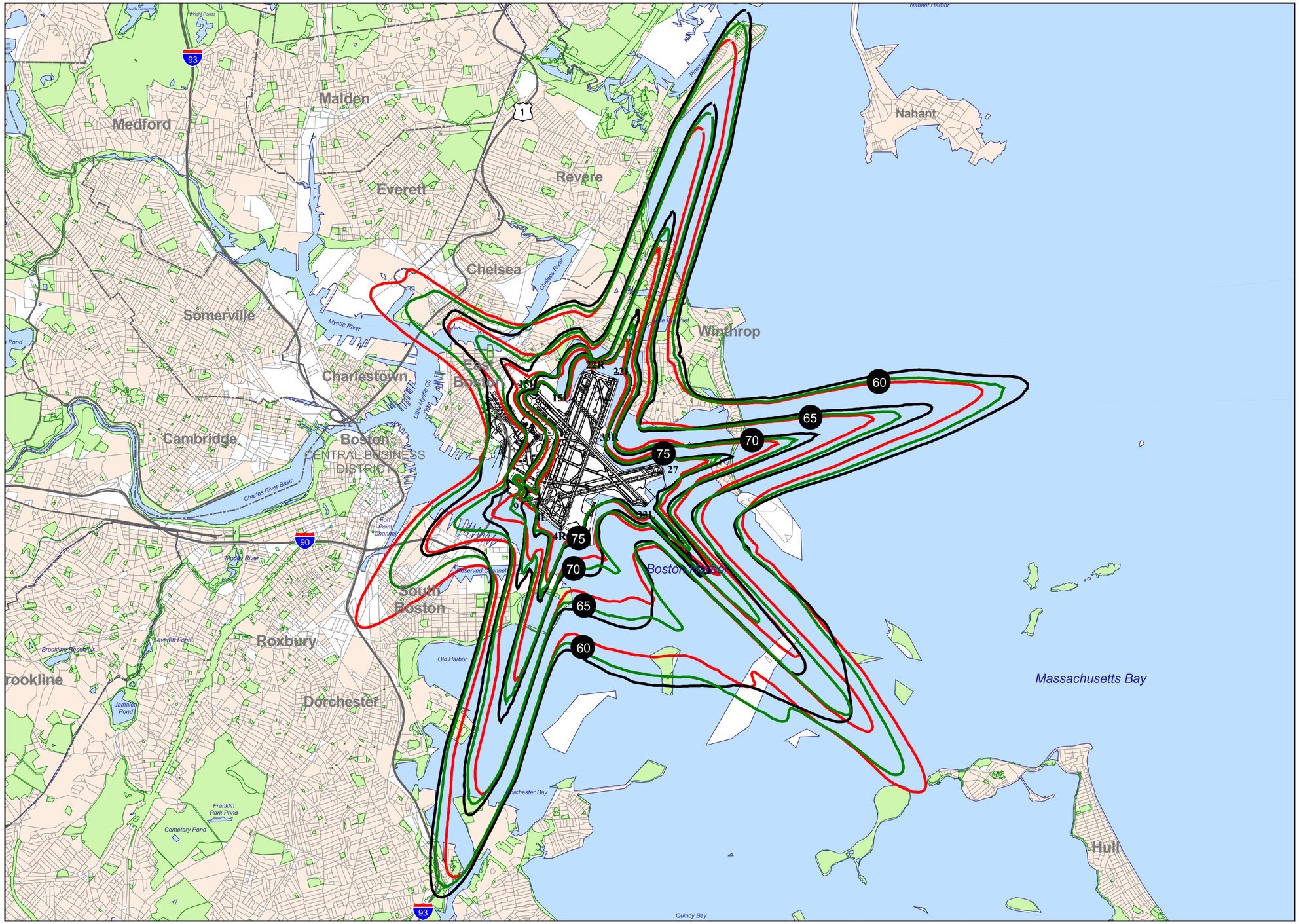
The development of the South Boston Waterfront area would be considered compatible land use under 14 CFR Part 150 Land Use Compatibility Guidelines because that area of South Boston is currently (see Logan Airport 2000 EDR) and would continue to be at or less than 69 dB DNL under both the No Action Alternative and the Preferred Alternative for the scenarios analyzed in this Final EIS. Indeed, the Preferred Alternative with the proposed northwest/southeast wind restriction would remove all but a small portion of the South Boston waterfront area from the 65 dB DNL contour under the long-term 37.5M High RJ scenario.

Table 3.8-7
Noise Exposed Housing Units by Town or Neighborhood with a 10-Knot Northwest/Southeast Wind Restriction - 29M Low Fleet Scenario

				10-Knot Restriction		Change Relative to No Action		
Community	**DNL**	**No Action**	**Pref. Alt.**	**NW**	**NW/SE**	**Pref. Alt.**	**NW**	**NW/SE**
Chelsea	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	1,051	1,193	1,180	946	142	129	(105)
	60 dB and above	4,359	4,359	4,185	4,001	-	(174)	(358)
Dorchester	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	54	-	-	-	(54)	(54)	(54)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Orient Heights	70 dB and above	111	76	76	76	(35)	(35)	(35)
	65 dB and above	271	336	260	266	65	(11)	(5)
	60 dB and above	1,851	1,894	1,709	1,719	43	(142)	(132)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Eagle Hill	70 dB and above	130	130	130	130	-	-	-
	65 dB and above	2,158	1,886	1,805	1,805	(272)	(353)	(353)
	60 dB and above	6,323	6,323	6,095	6,095	-	(228)	(228)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Jeffries Point	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	1,093	1,093	950	950	-	(143)	(143)
East Boston -	75 dB and above	-	-	-	-	-	-	-
Other	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	1,060	1,060	718	932	-	(342)	(128)
	60 dB and above	2,659	2,811	2,278	2,329	152	(381)	(330)
Total East	75 dB and above	-	-	-	-	-	-	-
Boston	70 dB and above	241	206	206	206	(35)	(35)	(35)
	65 dB and above	3,489	3,282	2,783	3,003	(207)	(706)	(486)
	60 dB and above	11,926	12,121	11,032	11,093	195	(894)	(833)
Everett	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	135	833	1,757	526	698	1,622	391
Quincy	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	426	426	426	426	-	-	-
Revere	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	1,410	1,363	1,363	1,363	(47)	(47)	(47)
	60 dB and above	2,756	2,662	2,516	2,573	(94)	(240)	(183)
Roxbury	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	-	-	-	-	-	-
	60 dB and above	-	14	-	-	14	-	-

Table 3.8-7 (*continued*)
Noise Exposed Housing Units by Town or Neighborhood with a 10-Knot Northwest/Southeast Wind Restriction - 29M Low Fleet Scenario

				10-Knot Restriction		Change Relative to No Action		
Community	**DNL**	**No Action**	**Pref. Alt.**	**NW**	**NW/SE**	**Pref. Alt.**	**NW**	**NW/SE**
South Boston	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	-	42	-	-	42	-	-
	60 dB and above	3,595	3,431	3,866	3,866	(164)	271	271
Winthrop - Court Rd	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	38	107	38	38	69	-	-
	65 dB and above	563	614	547	547	51	(16)	(16)
	60 dB and above	1,208	1,208	1,208	1,208	-	-	-
Winthrop - Other	75 dB and above	-	-	-	-	-	-	-
	70 dB and above	-	-	-	-	-	-	-
	65 dB and above	273	300	163	163	27	(110)	(110)
	60 dB and above	2,100	2,133	1,995	1,995	33	(105)	(105)
Winthrop - Point Shirley	75 dB and above	57	2	22	22	(55)	(35)	(35)
	70 dB and above	433	283	344	344	(150)	(89)	(89)
	65 dB and above	869	710	761	761	(159)	(108)	(108)
	60 dB and above	1,426	1,250	1,256	1,353	(176)	(170)	(73)
Total Winthrop	75 dB and above	57	2	22	22	(55)	(35)	(35)
	70 dB and above	471	390	382	382	(81)	(89)	(89)
	65 dB and above	1,705	1,624	1,471	1,471	(81)	(234)	(234)
	60 dB and above	4,734	4,591	4,459	4,556	(143)	(275)	(178)
Total - All Communities	75 dB and above	57	2	22	22	(55)	(35)	(35)
	70 dB and above	712	596	588	588	(116)	(124)	(124)
	65 dB and above	7,655	7,504	6,797	6,783	(151)	(858)	(872)
	60 dB and above	27,985	28,437	28,241	27,041	452	256	(944)



Legend

No Action Alternative
60, 65, 70 and 75 DNL

Unrestricted
Preferred Alternative (ALT1-A)
60, 65, 70 and 75 DNL

Preferred Alternative
with a 10-Knot Restriction
60, 65, 70 and 75 DNL

Open Space

Census Blocks
Populated
Non-Populated

N

0 0.4 0.8 1.2 Miles

Figure 3.8-17

Day/Night Sound Levels
2015 37.5M High RJ Fleet DNL Contours
No Action vs. Unrestricted Preferred Alternative
vs. Preferred Alternative with a 10-Knot
Northwest / Southeast Restriction
60, 65, 70 and 75 dB DNL

Source: Harris Miller Miller & Hanson

THIS PAGE INTENTIONALLY LEFT BLANK

Table 3.8-8 presents the impacts of the northwest/southeast wind restriction on the estimated population within the 60, 65, 70, and 75 dB DNL contours for the individual towns and neighborhoods surrounding Logan. In each neighborhood and town, the impacted population with the northwest/southeast restriction is completely bounded by the impacted populations associated with the No Action and unrestricted Preferred Alternatives.

Table 3.8-8
Noise Exposed Population by Town or Neighborhood with a 10-Knot Northwest/Southeast Wind Restriction – 2015 37.5M High RJ Fleet Scenario

				10-Knot	Change vs. No Action	
Community	DNL	No Action	Pref. Alt.	NW/SE Restriction	Pref. Alt.	NW/SE Restriction
Chelsea	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	-	319	-	319	-
	60 dB and above	1,467	8,633	6,110	7,166	4,643
Dorchester	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	-	-	-	-	-
	60 dB and above	666	626	626	(40)	(40)
East Boston - Orient Heights	75 dB and above	65	65	65	-	-
	70 dB and above	352	352	352	-	-
	65 dB and above	1,247	574	713	(673)	(534)
	60 dB and above	4,597	3,537	3,959	(1,060)	(638)
East Boston - Eagle Hill	75 dB and above	-	-	-	-	-
	70 dB and above	-	3	-	3	-
	65 dB and above	274	4,319	2,432	4,045	2,158
	60 dB and above	5,112	13,682	9,390	8,570	4,278
East Boston - Jeffries Point	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	-	-	-	-	-
	60 dB and above	170	218	170	48	-
East Boston - Other	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	862	558	782	(304)	(80)
	60 dB and above	3,914	3,914	3,914	-	-
Total East Boston	75 dB and above	65	65	65	-	-
	70 dB and above	352	355	352	3	-
	65 dB and above	2,383	5,451	3,927	3,068	1,544
	60 dB and above	13,793	21,351	17,433	7,558	3,640
Everett	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	-	-	-	-	-
	60 dB and above	-	-	-	-	-
Quincy	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	610	-	-	(610)	(610)
	60 dB and above	610	610	610	-	-

Table 3.8-8 (*continued*)
Noise Exposed Population by Town or Neighborhood with a 10-Knot Northwest/Southeast Wind Restriction – 2015 37.5M High RJ Fleet Scenario

				10-Knot	Change vs. No Action	
Community	DNL	No Action	Pref. Alt.	NW/SE Restriction	Pref. Alt.	NW/SE Restriction
Revere	75 dB and above	-	-	-	-	-
	70 dB and above	2,364	1,428	2,195	(936)	(169)
	65 dB and above	4,127	3,852	3,905	(275)	(222)
	60 dB and above	9,566	7,066	8,815	(2,500)	(751)
Roxbury	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	-	-	-	-	-
	60 dB and above	-	-	-	-	-
South Boston	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	1,360	881	980	(479)	(380)
	60 dB and above	3,709	7,439	4,154	3,730	445
Winthrop – Court Rd	75 dB and above	-	-	-	-	-
	70 dB and above	369	-	279	(369)	(90)
	65 dB and above	1,441	1,044	1,263	(397)	(178)
	60 dB and above	3,191	3,191	3,191	-	-
Winthrop - Other	75 dB and above	-	-	-	-	-
	70 dB and above	-	-	-	-	-
	65 dB and above	1,002	239	761	(763)	(241)
	60 dB and above	5,115	3,680	4,496	(1,435)	(619)
Winthrop – Point Shirley	75 dB and above	82	-	2	(82)	(80)
	70 dB and above	656	439	554	(217)	(102)
	65 dB and above	1,555	1,280	1,466	(275)	(89)
	60 dB and above	2,584	2,329	2,454	(255)	(130)
Total Winthrop	75 dB and above	82	-	2	(82)	(80)
	70 dB and above	1,025	439	833	(586)	(192)
	65 dB and above	3,998	2,563	3,490	(1,435)	(508)
	60 dB and above	10,890	9,200	10,141	(1,690)	(749)
Total – All Communities	75 dB and above	147	65	67	(82)	(80)
	70 dB and above	3,741	2,222	3,380	(1,519)	(361)
	65 dB and above	12,478	13,066	12,302	588	(176)
	60 dB and above	40,701	54,925	47,889	14,224	7,188

3.8.6.5 Other Environmental Impacts

Since adding a northwest/southeast wind restriction to Runway 14/32 involves no on-airport construction, it will have no impact on biotic communities, water resources, soil/sediment resources, or coastal zone resource areas. However, as demonstrated by the analysis in the previous sections, a wind restriction would have some impact on delays and runway utilization. As these changes in delays and runway use could have potential impacts on ground noise, air quality, historical resources, other Section 4(f) resources, and

Environmental Justice, these impacts are discussed both qualitatively and quantitatively in the following sections.

Ground Noise

Section 2.2.1 and Section 3.10.1 of this Final EIS explain that the implementation of the unrestricted Preferred Alternative reduces ground noise impacts in communities adjacent to the northeast portion of the airfield (Court Road in Winthrop plus Orient Heights and Constitution Beach in East Boston) relative to the No Action Alternative. These ground noise benefits occur primarily because Runway 14/32 allows controllers to shift operations away from the north/south parallel runways. Taxi operations to and from the north/south parallel runways produce the ground noise impacts in the East Boston and Winthrop neighborhoods, and the unrestricted Preferred Alternative reduces reliance on these runways.

Given that the changes in ground noise impacts are based primarily on the use of the north/south runways, an examination of north/south runway use allows a qualitative determination regarding the ground noise impacts associated with a 10-knot northwest/southeast restriction. Since the north/south runway use associated with the 10-knot northwest/southeast wind restriction is bounded by the north/south runway use associated with the No Action and unrestricted Preferred Alternatives (see Table 3.8-4), the ground noise impacts associated with the 10-knot northwest/southeast wind restriction are bounded as well.

Air Quality

In general, the effects of the northwest/southeast wind restriction on air quality conditions are bounded quantitatively by the analytical results previously derived for the No-Action and unrestricted Preferred Alternatives.

From the standpoint of total air emissions, the northwest/southeast wind restriction will add some additional aircraft taxi-in, taxi-out and delay time causing a corresponding increase in aircraft ground-based emissions when compared to the unrestricted Preferred Alternative. However, total emissions with a wind restriction are still expected to be less than those anticipated under the No-Action Alternative, which resulted in even longer ground-based times-in-modes.

While the air quality dispersion analysis could be impacted by changes in runway utilization, the computer modeling of the No Action and unrestricted Preferred Alternatives showed that pollutant concentrations around the airport are well within the National Ambient Air Quality Standards (NAAQS). Because of this, any change in airfield operating conditions (i.e. runway use) with a northwest/southeast wind restriction would result in a very small change to air quality in general, and to the modeled concentrations in particular. Ambient (i.e. outdoor) concentrations of the criteria air pollutants (i.e. CO, NO_2, PM) and volatile organic compounds (VOCs) are expected to remain within EPA guidelines and would not cause violations of the NAAQS.

In summary, the air quality impacts of any wind restriction are bounded by the impacts of the No Action and unrestricted Preferred Alternatives and would not result in any violations of the NAAQS.

Historical Resources

As with the unrestricted Preferred Alternative described in Section 2.2.8 of this Final EIS, the Preferred Alternative with a 10-knot northwest/southeast wind restriction will have no adverse effect on historical properties. No additional historic properties fall within the 29M Low 65 dB DNL contour as a result of the 10-knot northwest/southeast wind restriction on Runway 14/32. Cultural resources including historic resources and parklands, which are regulated under Section 4(f) of the Department of Transportation Act, the National Historic Preservation Act ("Section 106") and by state regulations concerning historic properties, are not actually or constructively used by the Preferred Alternative, with or without a 10-knot northwest/southeast wind restriction.

Other Section 4(f) Resources

The implementation of the Preferred Alternative with a 10-knot northwest/southeast wind restriction will neither incorporate land from a Section 4(f) resource nor affect the normal activity or aesthetic value of a public park, recreation area or wildlife refuge. The 10-knot northwest/southeast wind restriction does not add any new parklands within the 65 dB DNL contour when compared to the No Action Alternative. While the Arnold Arboretum, Emerald Necklace and Franklin Park are well outside the 65 dB DNL contour, the Boston Harbor Islands are already within the No Action 65 dB DNL contour, will not experience new noise impacts, and will not be actually or constructively taken by the Airside Project.

Environmental Justice

Section 6.8 of the Supplemental DEIS/FEIR and Section 3.6.4 of this Final EIS explain that there is no disproportionately high and significant adverse impact on minority and low-income populations caused by the unrestricted Preferred Alternative. Similarly, there is no disproportionately high and significant adverse impact on minority and low-income populations caused by the Preferred Alternative with a 10-knot northwest/southeast wind restriction.

As shown in Table 3.8-9, approximately 34 percent of the 2000 Census population within the 65 dB DNL No Action contour are minority. Table 3.8-10 shows that with a 10-knot northwest/southeast wind restriction, the same percentage (34 percent) of the population within the 65 dB DNL contour are minority. In comparison, the baseline population of Suffolk County is 48 percent minority, indicating that the adverse noise impacts of the Preferred Alternative with a 10-knot northwest/southeast wind restriction are not predominately borne by minority populations.

As shown in Table 3.8-11, approximately 38 percent of the 2000 Census population within the 60 dB DNL No Action contour are minority. Table 3.8-12 shows that with a 10-knot northwest/southeast wind restriction, approximately 37 percent of the population within

the 60 dB DNL contour are minority. In comparison, the baseline population of Suffolk County, Everett, and Quincy is 44 percent minority.

As the 2000 Census data on income is not yet available, 1990 Census data was used to evaluate the impact of the northwest/southeast wind restriction on low-income persons.[29] To maintain consistency with the analysis of low-income population in the Supplemental DEIS/FEIR, population was considered low-income if the median household income was at or below $10,560. A median household income of $15,840 was also analyzed.

There are no low-income populations within the 70 or 75 dB DNL contours under the No Action Alternative or the Preferred Alternative with a 10-knot northwest/southeast restriction. Table 3.8-13 shows the impacted low-income population within the 65 dB DNL contour for the No Action Alternative, while Table 3.8-14 presents the same information for the 10-knot northwest/southeast wind restriction scenario. Under both scenarios, the total population within the contours with a household income of less than $10,560 represents 0.1 percent of the total impacted population. The affected population with household income less than $15,840 increases, from 0.4 percent under the No Action Alternative to 0.5 percent with the Preferred Alternative and a northwest/southeast restriction. It still represents a very small percentage of the affected population as a whole. Both percentages are well below the percentage (18.1 percent) of the Suffolk County population below the poverty rate. Based on this analysis, the adverse noise impacts of the Preferred Alternative with a 10-knot northwest/southeast wind restriction are not predominately borne by low-income populations. See Tables 3.8-15 and 3.8-16 for analysis of the 60 dB DNL.

29 Note that the total population counts do not match the 2000 Census counts due to both changes in demographics and changes in population centroids. See Section 3.6, Census 2000 Update. For all analysis in this Final EIS besides the Environmental Justice analysis of low-income populations, the 2000 Census counts have been utilized.

Table 3.8-9
Estimated Population within the 65 dB Contour (Census 2000) for the 29M Low No Action Alternative

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	2,901	917	1,984	105	1,753	57	7	12	50
Dorchester	0	0	0	0	0	0	0	0	0
East Boston	8,822	5,160	3,662	106	2,959	264	11	35	287
Everett	0	0	0	0	0	0	0	0	0
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	0	0	0	0	0	0	0	0	0
Revere	3,074	2,437	637	89	370	67	7	28	76
Roxbury	0	0	0	0	0	0	0	0	0
South Boston	0	0	0	0	0	0	0	0	0
South End	0	0	0	0	0	0	0	0	0
Winthrop	4,163	3,988	175	29	71	35	4	4	32
Total	18,960	12,502	6,458	329	5,153	423	29	79	445
% of Total		66%	34%	2%	27%	2%	0%	0%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

Table 3.8-10
Estimated Population within the 65 dB Contour (Census 2000) for the 29M Low Preferred Alternative with a 10-Knot Northwest/Southeast Wind Restriction

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	2,715	782	1,933	97	1,719	52	7	13	45
Dorchester	0	0	0	0	0	0	0	0	0
East Boston	7,619	4,504	3,115	98	2,547	206	9	27	228
Everett	0	0	0	0	0	0	0	0	0
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	0	0	0	0	0	0	0	0	0
Revere	2,994	2,372	622	88	363	66	7	28	70
Roxbury	0	0	0	0	0	0	0	0	0
South Boston	0	0	0	0	0	0	0	0	0
South End	0	0	0	0	0	0	0	0	0
Winthrop	3,607	3,454	153	23	66	32	4	2	26
Total	16,935	11,112	5,823	306	4,695	356	27	70	369
% of Total		66%	34%	2%	28%	2%	0%	0%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

Table 3.8-11
Estimated Population within the 60 dB Contour (Census 2000) for the 29M Low No Action Alternative

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	12,047	3,828	8,219	436	7,125	331	36	62	229
Dorchester	136	111	25	14	1	10	0	0	0
East Boston	30,157	16,097	14,060	577	11,089	1,139	50	311	894
Everett	319	247	72	32	15	9	-	2	14
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	610	544	66	9	10	33	1	2	11
Revere	6,147	4,872	1,275	133	735	187	10	41	169
Roxbury	0	0	0	0	0	0	0	0	0
South Boston	7,358	6,065	1,293	174	591	342	35	9	142
South End	0	0	0	0	0	0	0	0	0
Winthrop	11,397	10,839	558	85	233	110	18	19	93
Total	68,171	42,603	25,568	1,460	19,799	2,161	150	446	1,552
% of Total		62%	38%	2%	29%	3%	0%	1%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

Table 3.8-12
Estimated Population within the 60 dB Contour (Census 2000) for the 29M Low Preferred Alternative with a 10-Knot Northwest/Southeast Wind Restriction

				Minority Ethnicity Groups					
	Total Population	White[1]	Minority[2]	African American/Black[3]	Hispanic/ Latino	Asian and Pacific Islander[4]	Native American[5]	Other[6]	Multi-Race[7]
Back Bay	0	0	0	0	0	0	0	0	0
Charlestown	0	0	0	0	0	0	0	0	0
Chelsea	11,034	3,520	7,514	383	6,549	285	36	61	200
Dorchester	0	0	0	0	0	0	0	0	0
East Boston	28,104	15,058	13,046	522	10,320	1,088	44	248	824
Everett	1,183	942	241	63	78	33	3	12	52
Jamaica Plain	0	0	0	0	0	0	0	0	0
Long Island	0	0	0	0	0	0	0	0	0
Quincy	610	544	66	9	10	33	1	2	11
Revere	5,688	4,512	1,176	122	704	161	10	40	139
Roxbury	1,549	341	1,208	821	310	21	9	4	43
South Boston	7,912	6,601	1,311	177	597	350	35	9	143
South End	0	0	0	0	0	0	0	0	0
Winthrop	11,028	10,497	531	84	216	105	18	19	89
Total	67,108	42,015	25,093	2,181	18,784	2,076	156	395	1,501
% of Total		63%	37%	3%	28%	3%	0%	1%	2%

Source: U.S. Census Bureau PL 94-171 Census 2000 Redistricting Data

1 Includes all persons who indicated their race as White, not of Hispanic origin.

2 Includes all persons who indicated their race as African American, American Indian, Asian or Pacific Islander and Other Race, not of Hispanic origin, as well as Hispanic/Latino persons.

3 Includes all persons who indicated their race as Black/African American, not of Hispanic origin.

4 Includes all persons who indicated their race as Asian or Pacific Islander, not of Hispanic origin.

5 Includes all persons who indicated their race as Native American Indian, not of Hispanic origin.

6 Includes all persons who indicated their race as Other Single Race, not of Hispanic origin.

7 Includes all persons who indicated to having two or more races, not of Hispanic origin.

Table 3.8-13
Estimated Low-Income Population within the 65 dB Contour (Census 1990) for the 29M Low No Action Alternative

	Total Population 65 dB DNL	Household Income	
		<$10,560 Poverty Level	<$15,840 150 percent Poverty Level
Back Bay	0	0	0
Charlestown	0	0	0
Chelsea	3,056	0	68
Dorchester	0	0	0
East Boston	7,117	0	0
Everett	0	0	0
Jamaica Plain	0	0	0
Long Island	0	0	0
Quincy	0	0	0
Revere	3,001	0	0
Roxbury	0	0	0
South Boston	66	18	18
South End	0	0	0
Winthrop	4,291	0	0
Total	**17,531**	**18**	**86**
% of Total		**(0.1%)**	**(0.4%)**

Source: 1990 U.S. Census Data, HMMH, 2002.

Table 3.8-14
Estimated Low-Income Population within the 65 dB Contour (Census 1990) for the 29M Low Preferred Alternative with a 10-Knot Northwest/Southeast Wind Restriction

	Total Population 65 dB DNL	Household Income	
		<$10,560 Poverty Level	<$15,840 150 percent Poverty Level
Back Bay	0	0	0
Charlestown	0	0	0
Chelsea	2,571	0	68
Dorchester	0	0	0
East Boston	6,491	0	0
Everett	0	0	0
Jamaica Plain	0	0	0
Long Island	0	0	0
Quincy	0	0	0
Revere	2,752	0	0
Roxbury	0	0	0
South Boston	72	18	18
South End	0	0	0
Winthrop	3,785	0	0
Total	**15,671**	**18**	**86**
% of Total		**(0.1%)**	**(0.5%)**

Source: 1990 U.S. Census Data, HMMH, 2002.

Table 3.8-15
Estimated Low-Income Population within the 60 dB Contour (Census 1990) for the 29M Low No Action Alternative

		Household Income	
	Total Population 60 dB DNL	<$10,560 Poverty Level	<$15,840 150 percent Poverty Level
Back Bay	0	0	0
Charlestown	0	0	0
Chelsea	10,232	1	1,227
Dorchester	0	0	0
East Boston	26,035	0	1,977
Everett	220	0	0
Jamaica Plain	0	0	0
Long Island	0	0	0
Quincy	0	0	0
Revere	5,227	0	125
Roxbury	0	0	0
South Boston	6,010	42	1,488
South End	0	0	0
Winthrop	11,799	0	0
Total	**59,523**	**43**	**4,817**
% of Total		**(0.1%)**	**(8.0%)**

Source: 1990 U.S. Census Data, HMMH, 2002.

Table 3.8-16
Estimated Low-Income Population within the 60 dB Contour (Census 1990) for the 29M Low Preferred Alternative with a 10-Knot Northwest/Southeast Wind Restriction

		Household Income	
	Non-Hispanic White Population 60 dB DNL	<$10,560 Poverty Level	<$15,840 150 percent Poverty Level
Back Bay	0	0	0
Charlestown	0	0	0
Chelsea	9,791	1	1,227
Dorchester	0	0	0
East Boston	23,858	0	1,733
Everett	144	0	0
Jamaica Plain	0	0	0
Long Island	502	502	502
Quincy	0	0	0
Revere	5,115	0	125
Roxbury	0	0	0
South Boston	6,452	42	1,488
South End	0	0	0
Winthrop	11,191	0	0
Total	57,833	545	5,075
% of Total		**(0.9%)**	**(8.8%)**

Source: 1990 U.S. Census Data, HMMH, 2002.

3.8.7 Conclusions

Using an unrestricted Runway 14/32 in accordance with the goals of Logan's PRAS would shift runway utilization patterns at Logan. While this would benefit the communities most severely impacted under the No Action Alternative, it would redistribute aircraft activity and noise over other highly populated areas at a time when Massport, with support from the FAA, has committed to begin working with the CAC to reassess the PRAS program as part of its Section 61 Findings (see Section 4.2 of this Final EIS).

For these reasons, in this Final EIS FAA proposes a 10-knot northwest/southeast wind restriction as a mitigation measure for the Preferred Alternative to prevent major shifts in runway utilization. Any recommendation concerning a wind restriction that might result from the updated PRAS would be subject to appropriate environmental review.

The analysis in this Final EIS demonstrates that with 10-knot northwest/southeast restriction in place, Runway 14/32 provides substantial delay reduction benefits while

preventing the changes in runway utilization that are predicted to occur with an unrestricted runway. The 10-knot northwest/southeast wind restriction does not materially change runway utilization when compared to CY 2000 runway end use. In addition, it reduces the total number of people within the 29M Low 65 dB DNL noise contour, without creating significant adverse noise impacts within individual communities when compared to the No Action Alternative. While the 10-knot northwest/southeast wind restriction would not allow improved performance relative to the existing PRAS goals beyond CY 2000 performance levels, preservation of the status quo is reasonable while PRAS is being updated. The 10-knot northwest/southeast restriction would achieve the purpose and need of the project to reduce delays during northwest wind conditions, and would do so without significantly redistributing aircraft operations and noise impacts over the communities to the west and northwest of the airport.

3.9 Safety Benefits of the Taxiway Improvements and Reduced Minimums

Public comments on the Supplemental DEIS/FEIR raised questions as to whether the Centerfield Taxiway and other taxiway improvements would increase the potential for runway incursions at Logan. In addition, other comments questioned the safety benefits of the proposed reductions in approach minimums. Safety is of paramount importance to both FAA and Massport. In April 2002, FAA reviewed the taxiway improvements and the reduced minimums to examine any safety-related issues. Representatives of the FAA, including the Flight Standards Division and Runway Safety Office, performed this review along with Massport personnel, and concluded that no decrease in safety would occur compared to the current operation and confirmed that the proposed taxiway improvements and reduced minimums enhance safety in addition to reducing delays.

This section discusses the safety aspects of the proposed taxiway improvements and reduced approach minimums, with particular emphasis on the Centerfield Taxiway. Public comments on the Centerfield Taxiway reflect concerns about safety risks, so this section presents operating procedures that demonstrate the safety and efficiency benefits of the Centerfield Taxiway.

3.9.1 Runway Incursions

The FAA defines a runway incursion as "any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off, intending to take off, landing, or intending to land." [30] In the context of taxiing aircraft, a runway incursion typically occurs when safe separation standards are violated by a taxiing aircraft that moves onto or across an active runway at a time when an arriving or departing aircraft is intending to use that runway.

During the twelve months ending June 2001, Logan was ranked 25th in the nation with 1.17 incursions per 100,000 operations, with a lower incursion rate than airports such as Los Angeles, New York LaGuardia, Washington Reagan, and St. Louis. Logan recorded six incursions during this period.

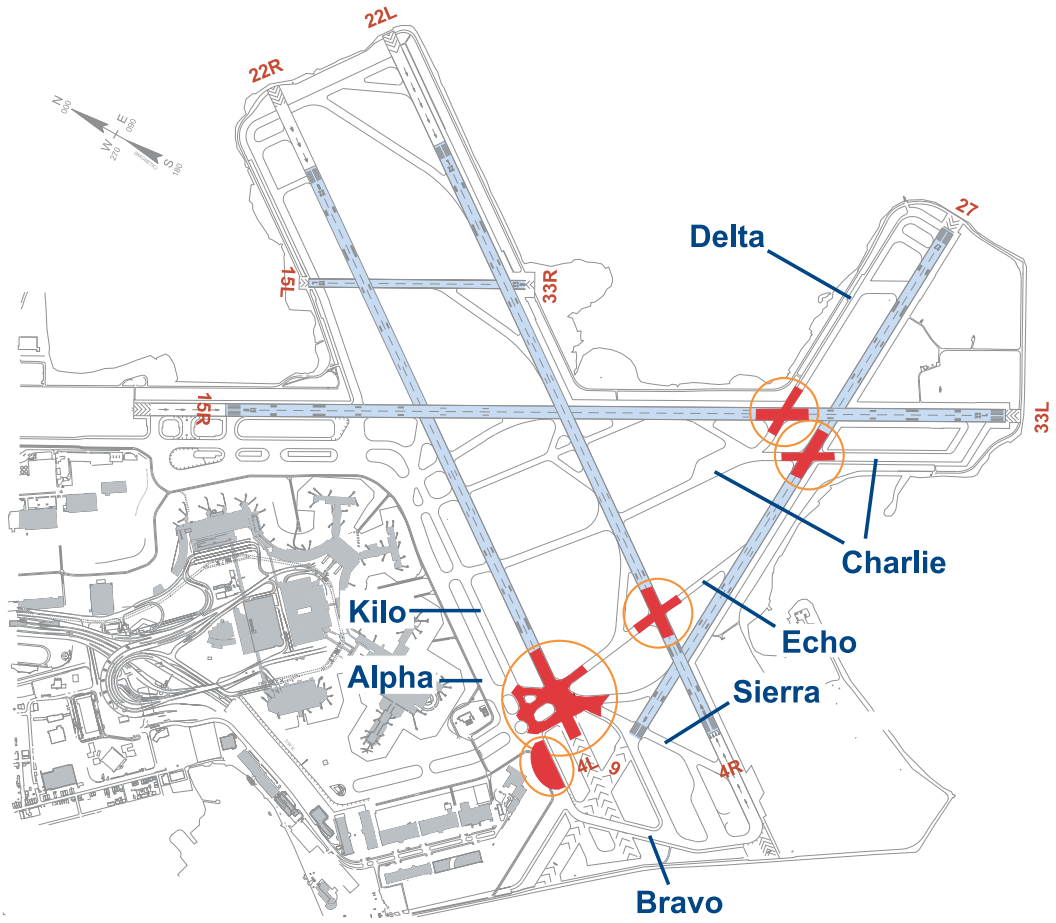
Figure 3.9-1 identifies locations on the existing airfield where the complexity of the airfield configuration could contribute to runway incursions and where runway incursions have occurred. For example, the southwest taxiway configuration is an especially complex portion of the airfield. Aircraft taxiing from the terminal apron onto Taxiway Sierra reach an intersection with Runway 4L that has a total of seven exits. The proposed southwest taxiway reconfiguration addresses this issue, among others.

Another complex area of the airfield that could contribute to runway incursions is at the intersection of Taxiways Delta and Charlie. When the airport is operating on Runways

30 National Runway Safety Program, FAA Order 7210.58: paragraph 5, item l.

33L and 27, departing aircraft are routed on Taxiway Charlie. Just prior to crossing Runway 33L, Taxiway Charlie forks right and Taxiway Delta turns slightly to the left, leading across Runway 33L. This represents an increased potential for incursions. The proposed taxiway Delta extension addresses this issue.

Figure 3.9-1 "Hot Spots" with Increased Potential for Runway Incursions



3.9.1.1 Previous Studies

All the taxiway improvements included in the Preferred Alternative were originally recommended in a study prepared in 1993, titled ***Runway Incursion Mitigation Plan***. A specially created Technical Advisory Committee provided oversight for the preparation of this study. This committee included representatives from the FAA Air Traffic Control Tower, the FAA New England Regional Office, the Air Transport Association, the Airline Pilots Association, Massport, and airlines serving Logan. The objective of the study was to identify potential revisions to the Logan taxiway configuration that would reduce the potential for runway incursions. The ***Runway Incursion Mitigation Plan*** also examined

runway incursion incidents at other airports and found that the top three factors in pilot-enabled taxi transgressions were:

- Misunderstanding of clearance;
- Airport configuration; and
- Pilot disorientation.

This analysis found that the airfield configuration was either a primary or contributing factor in nearly all incursions.

Massport, through the ***Logan Airfield Improvements Feasibility Study*** (Massport: July, 1995), conducted a more comprehensive evaluation of the recommendations of the ***Runway Incursion Mitigation Plan.*** This study included an initial examination of environmental consequences of these projects. The study also utilized computer modeling that confirmed the benefits identified in the ***Runway Incursion Mitigation Plan***. Taxiway improvements were included in the Preferred Alternative due to their ability to enhance Logan Airport's taxiway configuration and reduce the potential for pilot misunderstanding.

FAA has made reducing incursions one of its top priorities and has sponsored Logan's **Surface Incident Prevention Team,** which has been engaged in ongoing efforts to reduce incursions by:

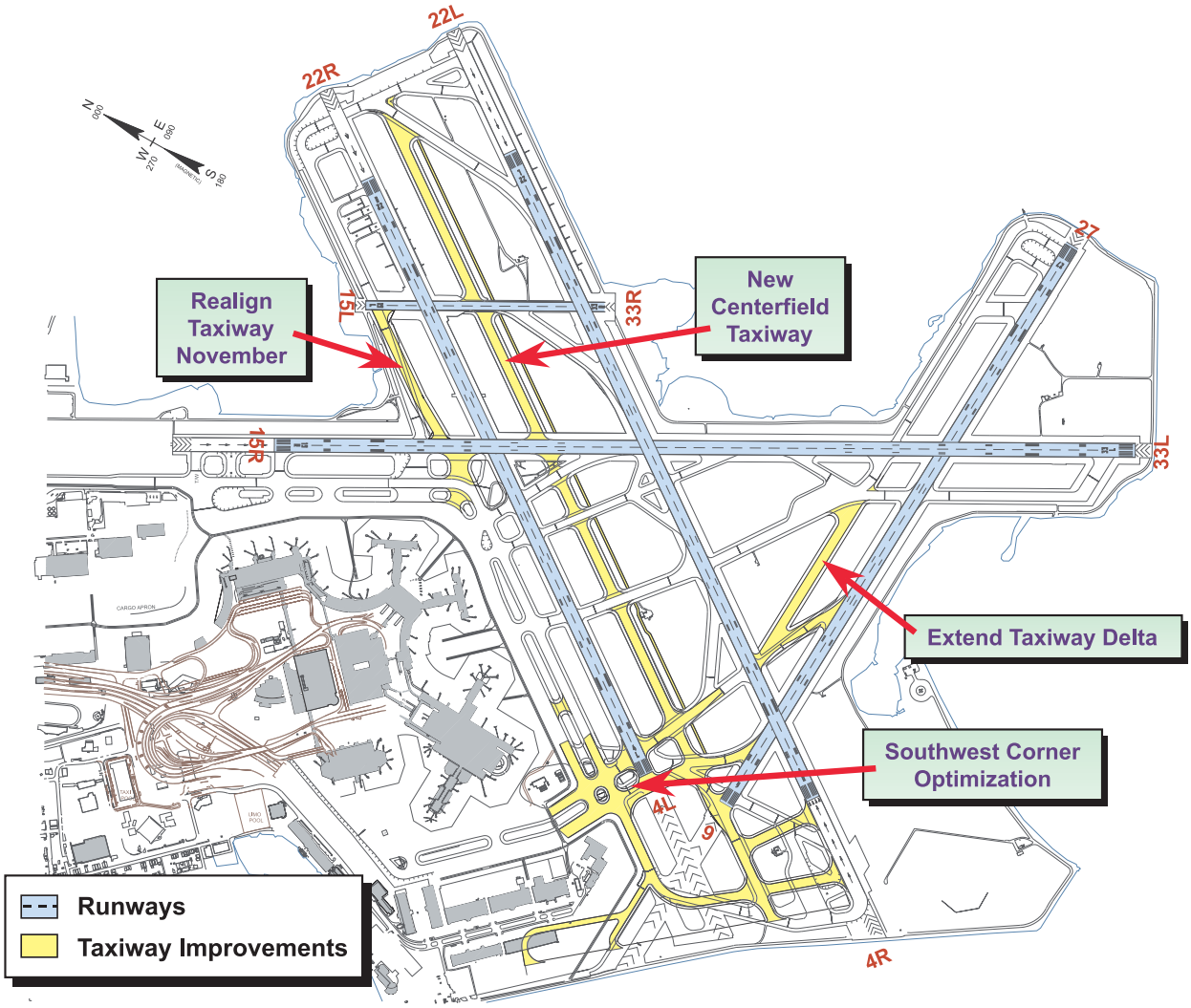
- Collecting and sharing data on such incidents;
- Providing additional education and training for pilots, controllers, and airport vehicle drivers, including a very effective "Hot Spots" poster to alert pilots to areas where the complexity of the airfield configuration could lead to incursions (see Figure 3.9-1);
- Providing guidance on the implementation of new standard signage, including efforts to simplify hold-lines in areas with overlapping protected limits and efforts to locate signs where they could most effectively be seen and be accurately interpreted by pilots;
- Supporting the FAA's policy on removing non-standard signage within the aircraft operational area;
- Participating in the development of new hold-line marking design, which provides high-contrast black background under yellow hold-line markings (dimensions of hold-line markings were also increased to improve their ability to attract attention within the complex airfield environment); and
- Endorsing and providing technical guidance on the design of the proposed taxiway projects.

3.9.2 Centerfield Taxiway

The Centerfield Taxiway, as currently designed, will both enhance airfield safety and increase the efficiency of aircraft taxiing operations (see Figure 3.9-2). The Centerfield Taxiway will increase the reliability of Logan operations by eliminating the need to use Runway 4L/22R as a taxiway whenever Taxiway November is unavailable due to construction, snow removal, or equipment problems. It also allows Logan to avoid taxiway conflicts from aircraft with wider wingspans and facilitates future innovations in optimizing aircraft flows. The safety and efficiency enhancements provided by the Centerfield Taxiway are summarized below and described in greater detail in Table 3.9-1:

- Provides multiple paths for routing aircraft to and from the ends of Runways 4L/22R and 4R/22L;
- Reduces the number and frequency of crossings of Runway 4L/22R;
- Enhances the efficiency of runway configuration changes;
- Avoids closing an active runway for use as a taxiway when other taxiways are temporarily unavailable;
- Provides safe taxiway routing for the next generation of heavy aircraft with wider wingspans;
- Allows for the implementation of ground delay programs without delaying aircraft not involved in such programs;
- Enables controllers to position ground-delayed aircraft in locations other than the runway end areas, thereby reducing ground noise impacts;
- Facilitates the return of departing aircraft to the terminal area when required by equipment malfunctions or de-icing, without delaying other aircraft;
- Eliminates congestion around the terminal area due to the impact of gate pushbacks and crossing inbound and outbound flows on Taxiway Kilo; and
- Increases the margin of safety by providing opportunities to move crossings away from areas where aircraft are operating at higher speeds.

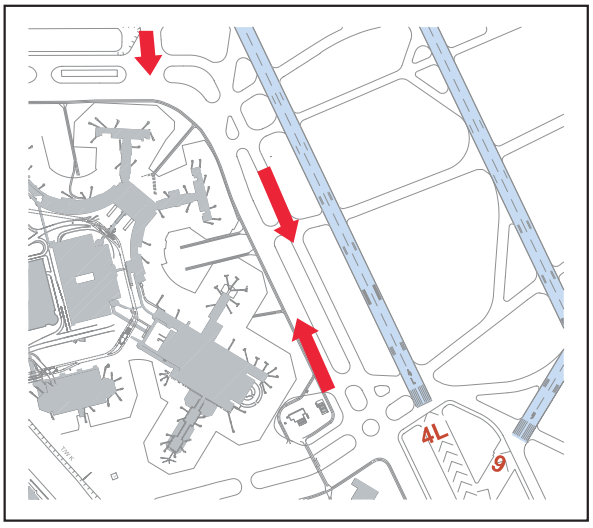
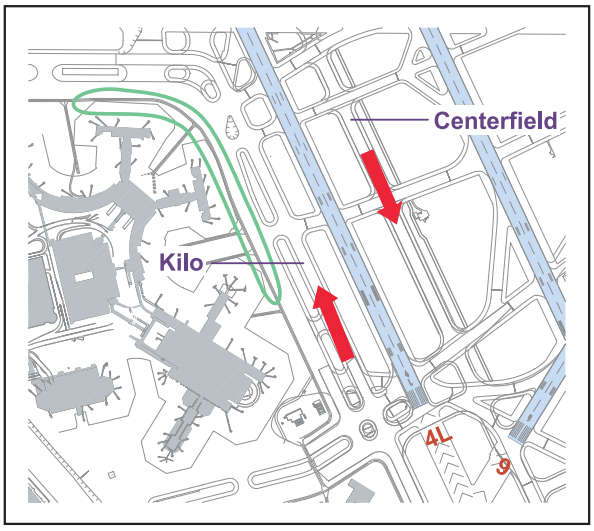
Figure 3.9-2 Proposed Taxiway Improvements

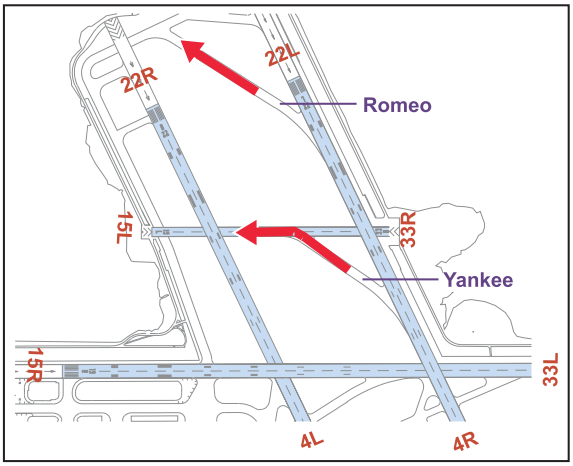
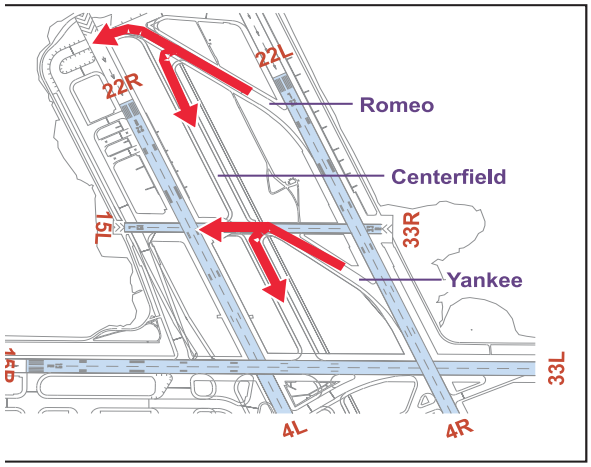
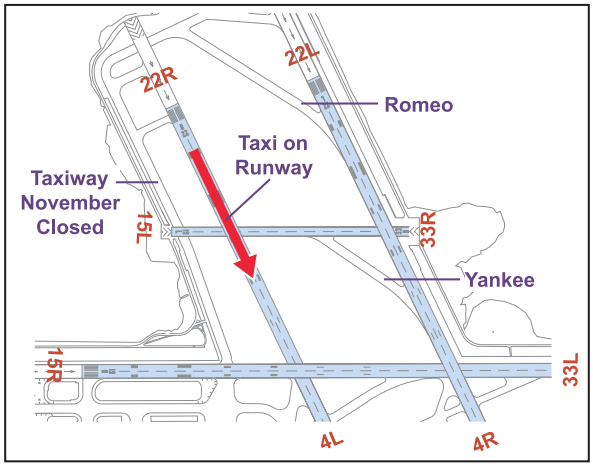
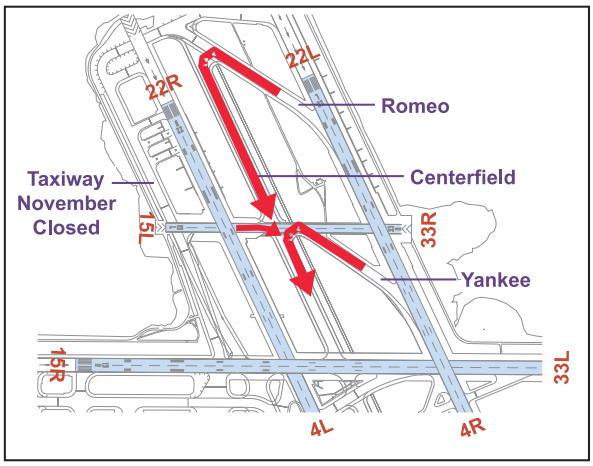


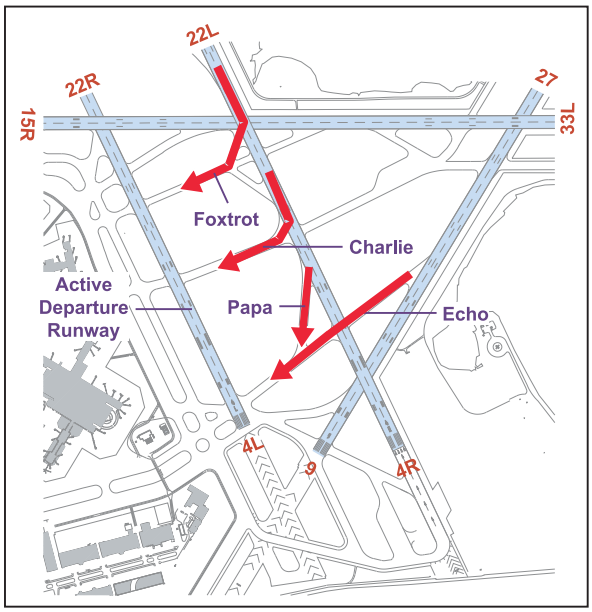
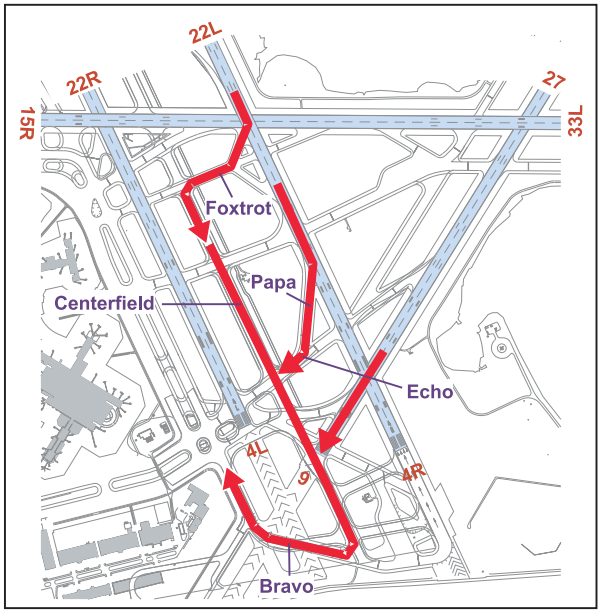
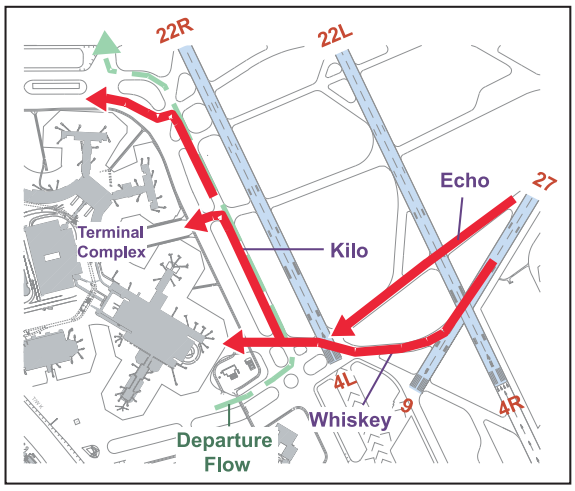
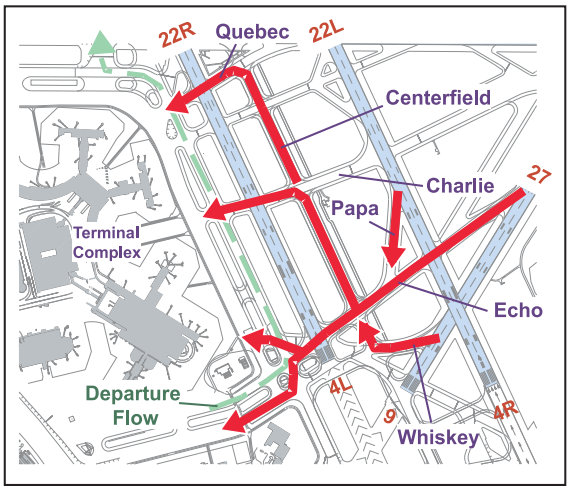
In response to public comments on the Supplemental DEIS/FEIR, a review of the use of the Centerfield Taxiway, as well as the other taxiway improvements, was conducted in April 2002 to examine any safety-related issues. Representatives of the FAA, including the Flight Standards Division and Runway Safety Office, performed this review along with Massport personnel. Based upon the FAA airport surface safety specialists' knowledge of the location of recent runway incursions at Logan, the typical locations of runway incursions at other airports, and the planned use of the proposed airport taxiway network, they concluded that no decrease in safety is expected compared to the current operation and confirmed that the taxiway improvements would enhance the safety and efficiency of Logan operations.

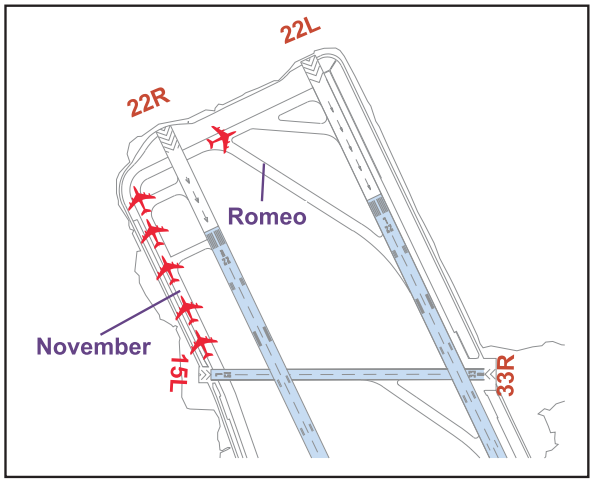
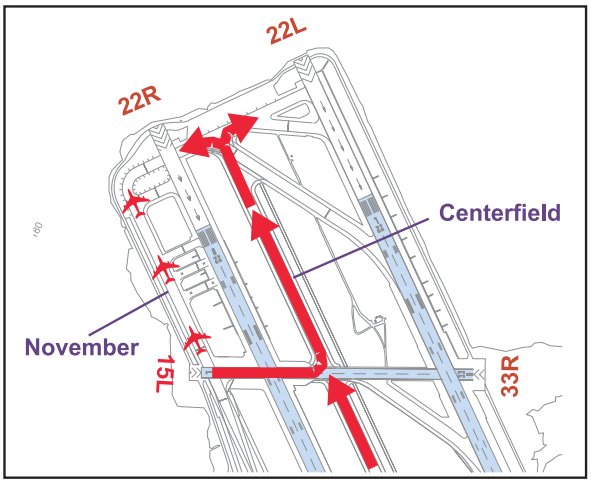
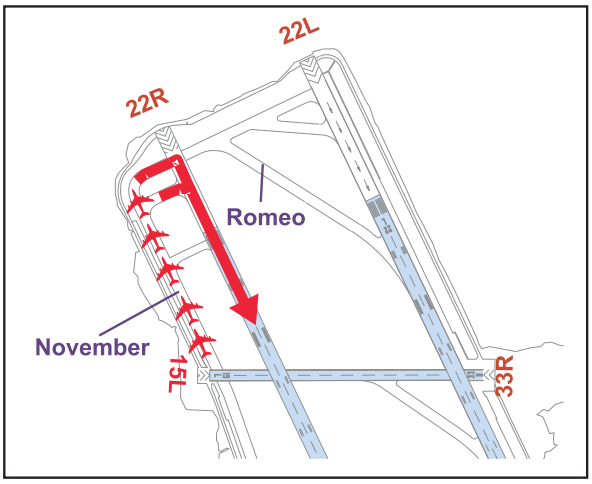
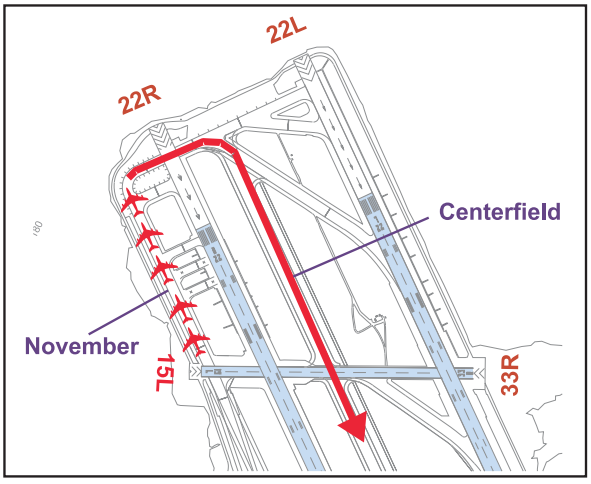
Table 3.9-1 presents more detailed operating procedures for the Centerfield Taxiway that illustrate how it achieves the previously listed enhancements in safety and efficiency with different runway configurations in effect. These operating procedures are consistent with the modeling performed and reported on in the Draft EIS/EIR and Supplemental DEIS/FEIR.

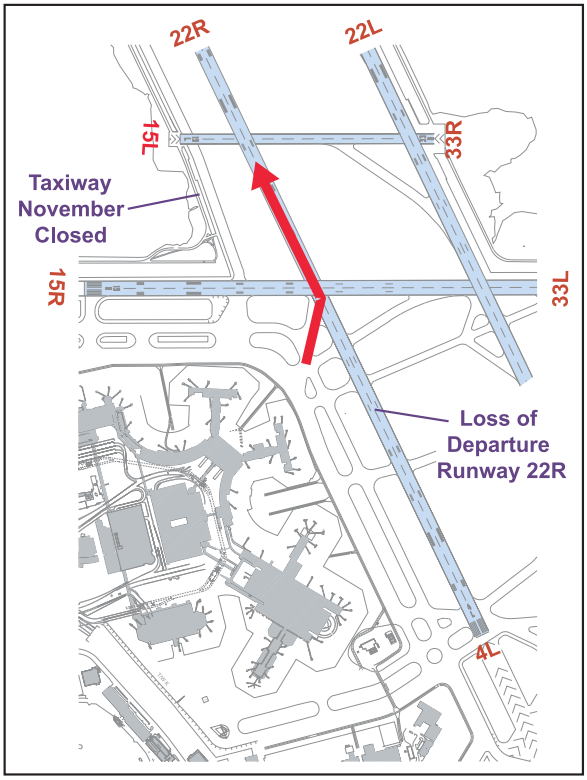
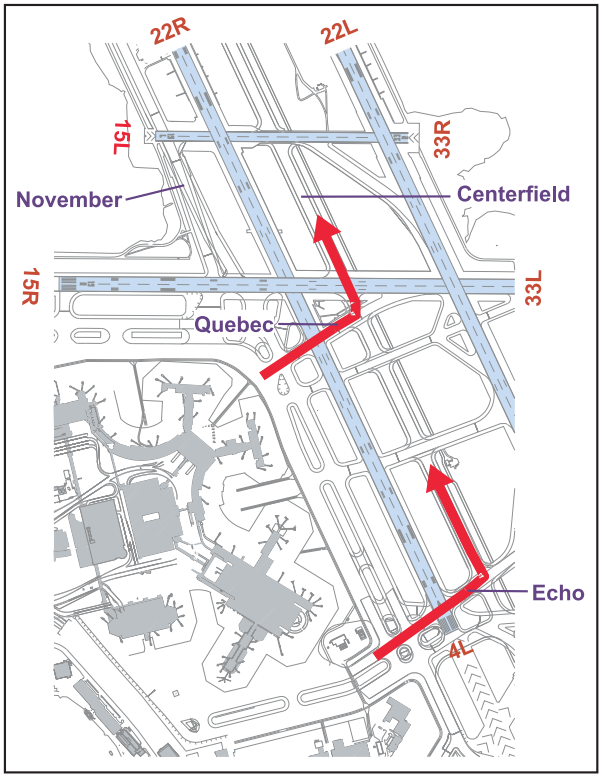
Table 3.9-1 Centerfield Taxiway Safety and Efficiency Enhancements

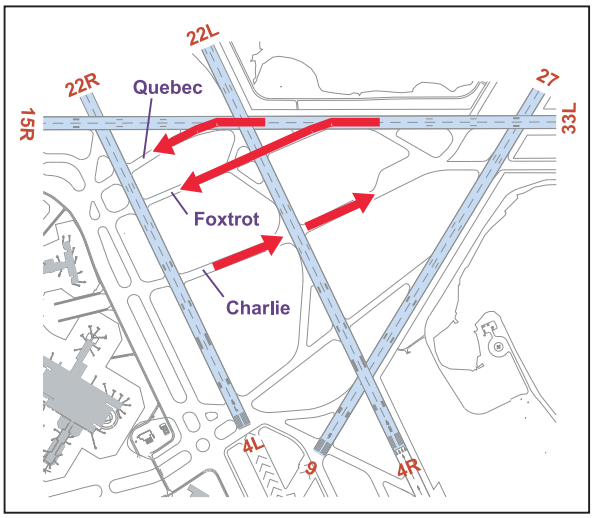
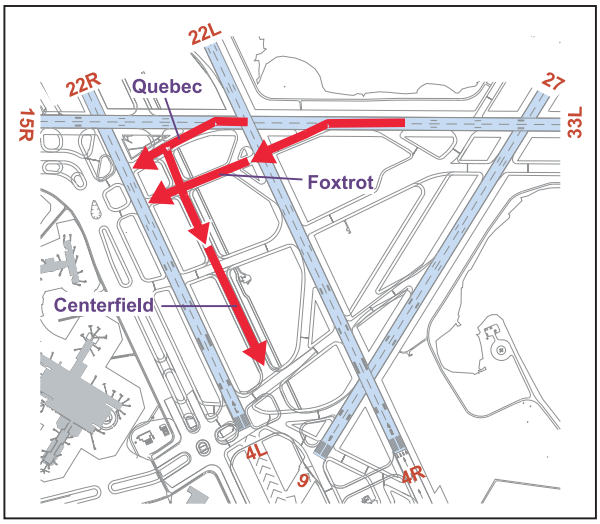
Existing Use	*Improvements*
Terminal Area Taxiway Congestion	
There is inadequate distance between portions of the gate area and the inner Taxiway Alpha. Aircraft cannot "push back" from gates without blocking Taxiway Alpha.	The Centerfield Taxiway can be used as a parallel route to supplement Taxiway Kilo.
	

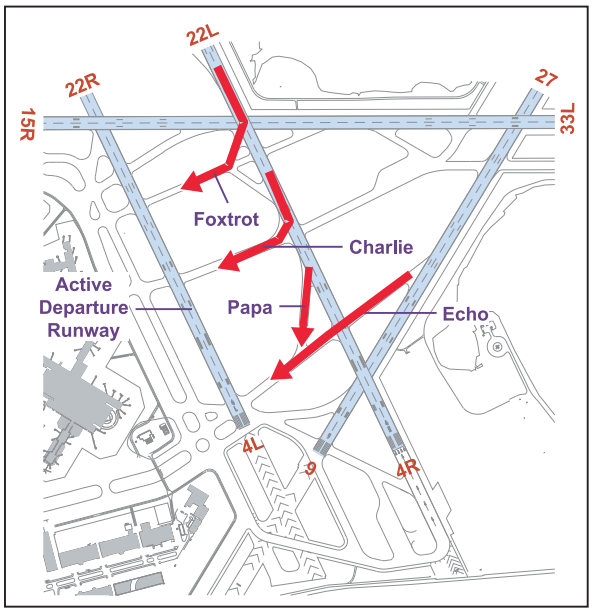
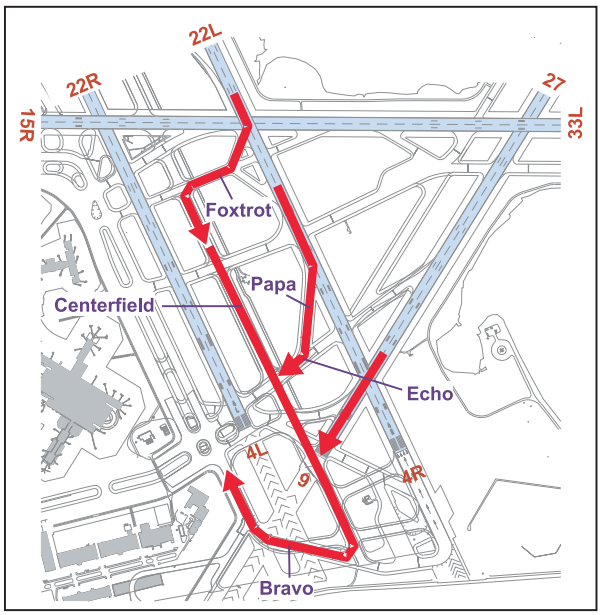
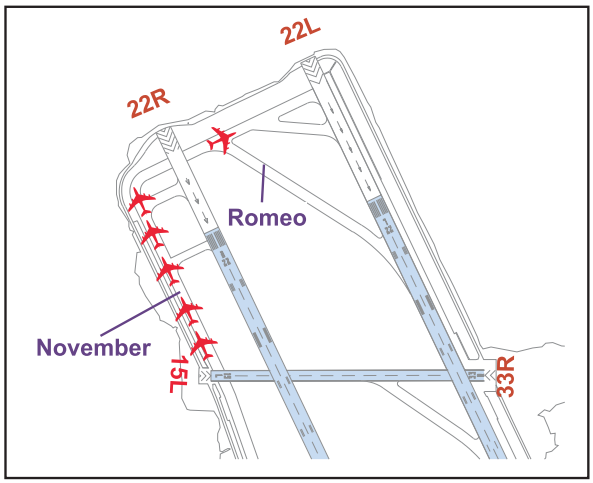
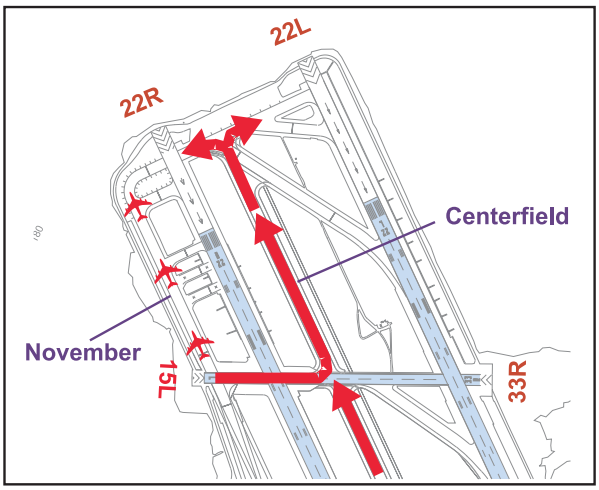
Existing Use	*Improvements*
Landing on Runways 4L and 4R & Departing on Runways 4L, 4R and 9	
Aircraft arriving on Runway 4R often have difficulty crossing Runway 4L. This creates delay and congestion in an area of the airfield close to residential areas. In addition, aircraft arriving on Runway 4R have frequent stops on inbound taxi routes due to congestion. This causes a substantial increase in ground noise and engine emissions each time an aircraft has to increase power to overcome inertia.	Centerfield Taxiway would allow arrivals to northern terminal areas to cross where they currently cross (at Runway 15L). Arrivals to the southern terminal areas could proceed southerly on the Centerfield Taxiway and cross Runway 4L closer to the terminal area or, if necessary, continue all the way to the end of the Centerfield Taxiway and go around the end of Runway 4L. Using the Centerfield Taxiway to permit arrivals to exit Runway 4R and proceed unimpeded towards the terminal area will reduce congestion and reduce the number of stops and starts during taxiing. This, combined with the other elements of the preferred alternative, will reduce ground noise by up to 5 dB DNL. (see Supplemental DEIS/FEIR, Table 6.2-16)
	
Any temporary closure of Taxiway November greatly reduces the capacity of this configuration as Runway 4L must be used as a taxiway, reducing the arrival acceptance rate by nearly fifty percent.	The Centerfield Taxiway provides a parallel route to minimize impact of any temporary closures of Taxiway November.
	

Existing Use	*Improvements*
Landing on 27/22L & Departing on 22R	
Arrivals to Runways 22L and 27 must cross active Runway 22R.	Arrival aircraft can use Centerfield Taxiway to access Taxiway Bravo clear of Runways 27 and 22R when there is significant departure activity on Runway 22R. This reduces runway crossings.
	
During periods of high arrival demand on Runway 27, aircraft typically exit at Taxiway Whiskey and the queue builds when Runway 22R is active.	Runway 27 arrivals can avoid congestion at Taxiway Whiskey by using the Centerfield Taxiway to access alternate crossing points.
	

Existing Use	*Improvements*
The single path to Runways 22R and 22L inhibits the positioning of aircraft requiring Runway 22L's departure length, the repositioning of Runway 22R departures for restricted departure times, and the sequencing of aircraft to minimize wake vortex spacing. Aircraft issued ground holds are often held at the intersection of Taxiways November and Romeo for departure on Runway 22L.	The Centerfield Taxiway provides an alternate route for departures going to Runway 22L and a bypass for those Runway 22R departures subject to a traffic management delay program.
	
Since Runway 22R departures cannot be rerouted without using an active runway, changing configurations requires waiting until the Taxiway November queue has cleared.	Aircraft could taxi on the Centerfield Taxiway to allow for faster and more expeditious changes in runway configurations.
	

Existing Use	*Improvements*
Departures from Runways 22L and 22R require Taxiway November. Disabled aircraft, snowplowing, or maintenance can close Taxiway November and cause significant delays.	The Centerfield Taxiway provides an alternate route when Taxiway November is under construction or closed for other reasons.
	

Existing Use	*Improvements*
Landing 33L/33R & Departing 27	
All arrivals must flow through the northeast corner of the terminal area, increasing congestion along with outbound aircraft heading for Taxiway Charlie.	The Centerfield Taxiway provides alternate routes to different terminals and minimizes the interaction with outbound taxiing. It also provides more time for ground control to monitor intersections with active runways and taxiways. *Note: Aircraft would not need to use the Centerfield Taxiway to cross Runway 33L when it is active.*
	

Existing Use	*Improvements*
Landing on 27/22L & Departing on 22R	
Arrivals to Runways 22L and 27 must cross active Runway 22R.	Arrival aircraft can use Centerfield Taxiway to access Taxiway Bravo clear of Runways 27 and 22R when there is significant departure activity on Runway 22R. This reduces runway crossings.
	
During periods of high arrival demand on Runway 27, aircraft typically exit at Taxiway Whiskey and the queue builds when Runway 22R is active.	Runway 27 arrivals can avoid congestion at Taxiway Whiskey by using the Centerfield Taxiway to access alternate crossing points.
	

Existing Use	*Improvements*
All Runway Configurations	
During periods of outbound delay, new arrivals may find that their gates are still occupied by earlier flights. Aircraft waiting for a gate are often taxied in a loop pattern along Taxiways Alpha and Kilo, increasing congestion and controller workload.	The Centerfield Taxiway can provide alternate routes for positioning aircraft in close proximity to their anticipated gates. It is anticipated that this positioning will occur near the terminal areas and south of Runway 33L/15R.
An aircraft given a ground delay and specific departure time could cause delays to many more aircraft due to the difficulty in re-sequencing the departure queue when parallel taxi routes are not available.	The Centerfield Taxiway provides alternate taxi routes essential for the staging and sequencing of aircraft involved in traffic management delay programs.

3.9.3 Other Taxiway Improvements

There are three other proposed taxiway improvements in addition to the Centerfield Taxiway. These more modest taxiway improvements are designed to improve taxiway flows and reduce the potential for pilot confusion. These taxiway improvements are primarily safety enhancements rather than delay reduction initiatives, and are described in greater detail in the following sections.

3.9.3.1 Taxiway November Realignment

Realigning Taxiway November, as shown in Figure 3.9-2, will provide a straight connection from Taxiway November north of Runway 15R/33L to Taxiway Kilo south of this runway. This realignment will reduce aircraft maneuvering between Taxiways November and Kilo and simplify the runway crossing. It will also eliminate the angled Taxiway Tango intersection with Runways 15R/33L and 4L/22R. These changes will reduce pilot workload and potential confusion in this area, particularly during low visibility and nighttime conditions. (Refer to Figure 3.9-2.)

3.9.3.2 Taxiway Delta Extension

Extending Taxiway Delta to Runway 4R/22L will provide an alternate taxi route for departures on Runways 33L and 27, reducing congestion on Taxiway Charlie, which is now the sole access to these runways. It will also allow the controllers to separate jets taxiing to these runways from non-jets making intersection departures on Runway 33L at Taxiway Golf and on Runway 27 at Taxiway Charlie. By segmenting these taxi flows and providing straight taxiway paths to the ends of Runways 27 and 33L, the Taxiway Delta extension will enhance safety by reducing the potential for pilot confusion. (Refer to Figure 3.9-2.)

3.9.3.3 Southwest Taxiway System Reconfiguration

The Preferred Alternative includes improvements that will simplify the Southwest Corner taxiway system. The current configuration of taxiways around the departure ends of Runways 4L, 4R, and 9 is complex and potentially confusing. The redesigned layout will provide a more logical and efficient flow to reduce the potential for pilot confusion for both inbound and outbound aircraft. Airfield safety will be improved by simplifying runway crossings and access in this vicinity. (Refer to Figure 3.9-2.)

3.9.4 Reduced Minimums

The proposed reduction in ceiling and visibility landing minimums on Runways 15R, 22L, 27 and 33L will allow air traffic controllers to assign runways which are more closely aligned with the wind during instrument conditions. Landing into a headwind is preferable since it reduces the touchdown speed of the aircraft. On the other hand, landing with a crosswind—especially with gusts—is a more difficult task. The reduced minimums will enhance safety by allowing landings following an instrument approach to be made into the prevailing wind and with minimum crosswinds. Reduced minimums also enhance safety by providing positive instrument guidance at low altitudes and by reducing the probability of missed approaches. The proposed reduced minimums at Logan Airport would be consistent with recommended practices as established in FAA Order 8260.3B, United States Standards for Terminal Instrument Procedures.

3.9.5 Conclusion

Safety is of paramount importance to both the FAA and Massport and many of the proposed improvements will enhance safety as well as reduce delays and improve airfield operational flexibility. All of the taxiway improvements included in the Preferred Alternative were originally recommended by the *Runway Incursion Mitigation Plan* prepared in 1993 by a specially created Technical Advisory Committee that consisted of representatives from the FAA Air Traffic Control Tower, the FAA New England Regional Office, the Air Transport Association, the Airline Pilots Association, Massport, and airlines serving Logan.

A review of the Centerfield Taxiway, as well as the other taxiway improvements, was conducted in April 2002 to examine any safety-related issues. Representatives of the FAA, including the Flight Standards Division and Runway Safety Office, performed this review along with Massport personnel and concluded that no decrease in safety would occur compared to the current operation and confirmed that the proposed taxiway improvements and reduced minimums enhance safety in addition to reducing delays.

3.10 Impacts of the Centerfield Taxiway

As a result of public concerns about the operation of the Centerfield Taxiway, FAA is proposing to conduct a study to evaluate potential beneficial operational procedures that would preserve or improve the operational and environmental benefits of the Centerfield Taxiway shown in the EIS. This study would be coordinated with affected parties and would address taxiing operations in the northern portion of the airfield, both on the existing Taxiway November and on the proposed Centerfield Taxiway. Section 4.2 discusses this study in greater detail, while this section examines the environmental impacts of the Preferred Alternative if a decision on the Centerfield Taxiway is deferred until the proposed study is completed.

3.10.1 Environmental Impacts and Benefits of the Centerfield Taxiway

While the Centerfield Taxiway was not examined as a separate improvement concept, the impacts of the taxiway improvements as a group can be isolated through a comparison of Alternative 2, All Improvements Except Runway 14/32, and Alternative 3, the No Build Alternative. The following sections describe this comparison as well as the interactions between the Centerfield Taxiway and the other improvement concepts in the Preferred Alternative.

3.10.1.1 Delay Reduction

The taxiway delay impacts have been segregated from the runway delay impacts throughout the EIS analysis process, and taxiway delays were compiled separately for every fleet scenario and improvement alternative for which they were analyzed. The Centerfield Taxiway is the largest contributor to taxiway delay reduction, while the other taxiway improvements (the Taxiway Delta Extension, the Taxiway November Realignment, and the Southwest Corner Optimization) have less delay reduction benefit. These more modest taxiway improvements are designed to simplify taxiway flows and eliminate pilot confusion, and thus serve primarily as safety enhancements rather than delay reduction initiatives.

Overall, the taxiway improvements reduce delays by approximately 5,000 to 11,000 annual hours. Table 3.10-1 shows that under a range of fleet scenarios, the taxiway improvements provide relatively fixed delay reduction benefits that represent only a small share of the total delay reduction benefits associated with the Preferred Alternative.

Table 3.10-1
Delay Reduction Benefits of All Taxiway Improvements

	Taxiway Delays			Total Delay Reduction	
Fleet	All Improvements Except 14/32 Alt. 2	No Build Alt. 3	Delay Reduction	Preferred Alternative Alt 1A	Percent due to Taxiway Improvements
29M Low	11,000	20,600	9,600	43,500	22%
29M High	7,900	18,900	11,000	67,900	16%
37.5M Low	16,000	25,900	9,900	77,900	13%
37.5M High	14,300	19,200	4,900	113,800	4%

Source: Airside Draft EIS/EIR, Table 4.5-6 and Table 4.5-3.

3.10.1.2 Ground Noise

Based on the ground noise analysis initially described in the Draft EIS/EIR, the highest ground taxi noise occurs at the three noise monitoring stations (NMS) around the northeast corner of the airport. More detail is provided in Section 5.2.7.2 of the Draft EIS/EIR. These three stations (NMS #7 - Loring Road near Court Road, Winthrop; NMS #10 – Bayswater & Shawsheen, East Boston; and NMS #12, East Boston Yacht Club, East Boston) are the closest to the Centerfield Taxiway and best reveal the potential ground noise impacts associated with its operation. Table 3.10-2 presents the modeled ground noise levels at these stations for four different fleets.

Based on the information presented in Table 3.10-2, the Centerfield Taxiway would have little impact on ground taxi noise. The average difference in noise between Alternatives 2 and 3 is 0.4 dB DNL or less. At each of the three stations impacted by the Centerfield Taxiway, noise can either increase or decrease depending on the fleet scenario. These increases and decreases are so small that they would not be readily detectable in the day-to-day environment, particularly when total aircraft noise impacts (including in-flight noise, noise from takeoff ground roll, and landing noise from thrust reversers) are considered.[31]

It should also be noted that while the taxiway improvements result in imperceptible changes in ground noise in the neighborhoods closest to the northern portion of the airfield, the Preferred Alternative results in more noticeable ground noise reductions. Compared to the No Action scenario, unidirectional Runway 14/32 increases use of the northwest configurations, which do not involve significant use of the Centerfield Taxiway and do not impact these ground noise receptors.

31 In general, changes in sound levels of 3 or 4 dB are barely perceptible. See "Aviation Noise Effects", Report No. FAA-EE-85-2, March 1985, page 3.

Table 3.10-2
Ground Noise Impacts of Taxiway Improvements

Noise Monitor/ Fleet	DNL from Ground Operations* All Except 14/32 Alt. 2	No Build Alt. 3	Change (Alt 2-Alt 3)	Preferred Alternative Alt 1A	No Action Alt. 4	Change (Alt 1A-Alt 4)
NMS #7: Loring Road near Court Road, Winthrop						
29M Low	45.5	45.3	0.2	45.1	45.3	-0.2
29M High	45.5	45.6	-0.1	45.8	46.0	-0.2
37.5M Low	51.3	51.4	-0.1	47.2	51.8	-4.6
37.5M High	48.1	49.3	-1.2	45.3	50.0	-4.7
Avg. Change			-0.3			-2.4
NMS #10: Bayswater & Shawsheen, East Boston						
29M Low	43.4	42.9	0.5	42.1	42.9	-0.8
29M High	43.4	43.0	0.4	43.0	43.5	-0.5
37.5M Low	46.5	47.1	-0.6	42.5	47.5	-5.0
37.5M High	45.9	44.5	1.4	43.6	45.1	-1.5
Avg. Change			0.4			-2.0
NMS #12: East Boston Yacht Club, East Boston						
29M Low	48.2	48.3	-0.1	47.3	48.3	-1.0
29M High	48.4	48.3	0.1	47.9	48.7	-0.8
37.5M Low	49.5	49.9	-0.4	47.0	50.2	-3.2
37.5M High	50.1	49.3	0.8	48.4	49.8	-1.4
Avg. Change			0.1			-1.6

* Average propagation conditions.
Source: Airside Draft EIS/EIR, Table 6.2-23 through Table 6.2-25, and Appendix L.

3.10.1.3 Air Quality

As with the ground noise analysis, the air quality impacts of the Centerfield Taxiway are best assessed through examination of the three receptors adjacent to the northern portion of the airfield (Receptor #2 – East Boston, Constitution Beach; Receptor #3 – East Boston, Bayswater; and Receptor # 4 – Winthrop, Court/Loring Roads)[32]. Because of their proximity, these receptors are the best indicators of the potential air quality impacts of the Centerfield Taxiway. From the standpoint of air quality, the primary difference between these Alternatives 2 and 3 at these locations is the presence and utilization of the Centerfield Taxiway.

The dispersion modeling results presented in Appendix M of the Draft EIS/EIR and Appendix F of the Supplemental DEIS/FEIR show that when Alternatives 2 and 3 are compared, there are either no significant differences in air pollution concentration or the

32 Note that the air quality receptors are different from the noise monitoring stations. See Table 6.4-3 and Figure 6.4-1 of the Supplemental DEIS/FEIR for the air quality modeling receptor locations

differences are very small. Table 3.10-3 presents the dispersion modeling results for Alternatives 2 and 3 for three receptors and four different fleet scenarios. The table shows that NO_2 levels differ by only ± 2 percent or less at these locations, with or without the Centerfield Taxiway. These results are comparable for other pollutants (i.e., CO, VOCs, and PM), which were presented in Section 6.3 and Appendix M of the Draft EIS/EIR and in Section 6.4 and Appendix F of the Supplemental DEIS/FEIR. In all cases, the modeled air pollution concentrations at receptors 2, 3, and 4 are well within the Federal and State guidelines, indicating that air pollution levels, with or without the Centerfield Taxiway, would not pose a threat to the public or the environment. Overall, the dispersion modeling results reflect the potential contributions of emissions from all airport-related sources (i.e., aircraft, ground service equipment, motor vehicles, etc.) across the entire airport. For this reason, the Centerfield Taxiway does not cause a significant change in the modeling results.

Table 3.10-3
Air Quality Impacts of Taxiway Improvements

	NO_2, Second Highest One-Hour Levels (micrograms per cubic meter)			
Receptor/Fleet	All Except 14/32 Alt. 2	No Build Alt. 3	Change (Alt 2-Alt 3)	Percent Change
Receptor #2 - East Boston/Constitution Beach				
29M Low	221	221	0	0.0%
29M High	217	215	2	0.9%
37.5M Low	239	238	1	0.4%
37.5M High	249	254	-5	-2.0%
Receptor #3 - East Boston/Bayswater				
29M Low	242	243	-1	-0.4%
29M High	223	224	-1	-0.4%
37.5M Low	264	267	-3	-1.1%
37.5M High	255	258	-3	-1.2%
Receptor #4 - Winthrop/Loring near Court Rd				
29M Low	216	215	1	0.5%
29M High	207	208	-1	-0.5%
37.5M Low	230	228	2	0.9%
37.5M High	225	223	2	0.9%

Note: Massachusetts Department of Environmental Protection standard is 320.
Source: Airside Draft EIS/EIR, Volume IV, Appendix M

3.10.1.4 Other Environmental Impacts

The Centerfield Taxiway does not impact runway use, therefore, if the FAA decides to conduct the proposed study of operational procedures for the Centerfield Taxiway, this decision would not impact historical resources, other Section 4(f) resources, or Environmental Justice. In addition, conducting further study and deferring any decision

on the Centerfield Taxiway would reduce on-airport construction, and thus could reduce the water quality, soils, biotic communities, coastal zone, and construction impacts. The environmental impacts of not building the Centerfield Taxiway would be bounded by the No Action and Preferred Alternatives. Even with the Centerfield Taxiway in place, the Preferred Alternative produced no significant environmental impacts within these categories.

3.10.1.5 Interaction with Runway 14/32 and Other Improvements

There is limited interaction between the Centerfield Taxiway and the other concepts included in the Preferred Alternative, specifically Runway 14/32. Aircraft arriving or departing on Runway 14/32 generally would not utilize the Centerfield Taxiway, and taxi flows to and from the runway ends in the northwest/southeast configurations do not benefit significantly from the taxiway. The primary benefit of the Centerfield Taxiway occurs while operating on the north/south runway configurations using Runways 4L/22R and 4R/22L because the Centerfield Taxiway aids in the crossing of Runway 4L/22R.

The Taxiway Delays Case Study in Appendix K of the Draft EIS/EIR examined the benefits of all of the proposed taxiway improvement concepts. As shown in Table 3.10-4, the delay reduction impacts of the taxiway improvements occurred primarily when operating to the northeast and southwest, while the taxiway delay benefits when operating to the northwest or southeast were nearly imperceptible. These results indicate that the Centerfield Taxiway has little utility when operating to the northwest or southeast, regardless of whether Runway 14/32 is constructed. The analysis demonstrates that the Centerfield Taxiway has little interaction with Runway 14/32.

Table 3.10-4
Reduction in Average Taxiway Delays by Primary Operating Direction

Operating Direction	Inbound / Outbound	Reduction in Average Delay (Minutes per Operation)
Northeast	Inbound	1.0
	Outbound	2.3
Southwest	Inbound	2.0
	Outbound	1.4
Northwest	Inbound	0.1
	Outbound	0.1
Southeast	Inbound	0.3
	Outbound	-0.1

Note: Average Taxiway Delay Reduction from Appendix K of the Draft EIS/EIR Taxiway Delay Case Study. Delays represent 37.5M Low Fleet with Average Day Terminal Assignments.

3.10.2 Conclusion

To address public concerns about the impact of the Centerfield Taxiway, the FAA is proposing to conduct a study to evaluate potential beneficial operational procedures that would preserve or improve the operational and environmental benefits of the Centerfield Taxiway shown in the EIS. A decision on the Centerfield Taxiway would be deferred until the study was completed. The Airside Project EIS operational and environmental analyses described in this section demonstrate that the potential deferment of the Centerfield Taxiway would have no discernable impact on the environmental impacts associated with the other improvement concepts in the Preferred Alternative.

3.11 Runway Capacity and Delay Modeling

Various commenters and reviewers requested additional clarification regarding the modeling approach (including various assumptions) used in the aircraft delay analyses set out in the Draft EIS/EIR and Supplemental DEIS/FEIR. The Draft EIS/EIR and the Supplemental DEIS/FEIR evaluated the operational and environmental impacts of the various Airside Project alternatives using state-of the art computer modeling and a wide range of future passenger and fleet scenarios. The operational models were designed to measure historic and future aircraft operating delays associated with the various improvement packages. These analyses provide the basis for comparing the predicted impacts of operating Logan Airport with the Preferred Alternative in place with the impacts of operating Logan under the No Action Alternative. This section further describes the modeling methodology used for the analyses in the EIS Documents.

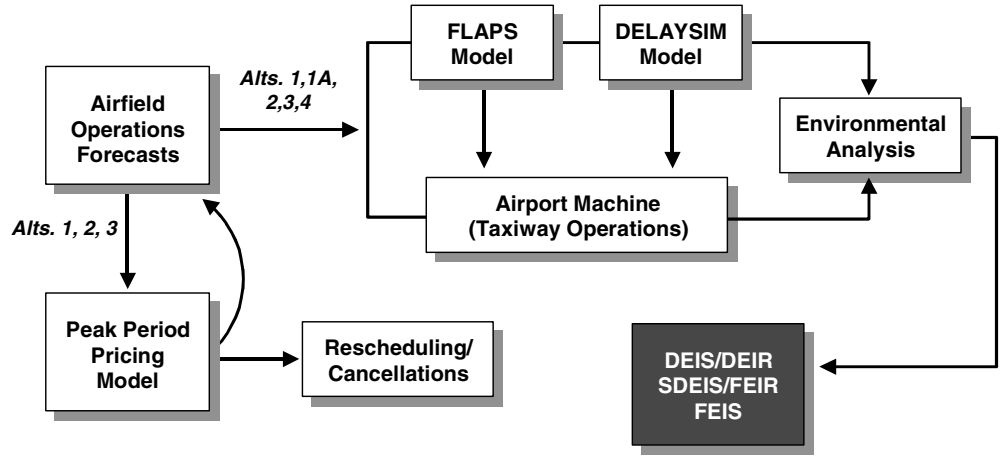
The operational models simulated the actual movement of individual aircraft from the approach fix to the arrival runway to the gate for arriving aircraft, and from the gate to the takeoff runway to the departure fix for departing aircraft. Modeling at this high level of detail enabled the delay models to generate inputs for the noise and air quality models, ensuring consistency between the estimates of future delays and environmental impacts.

This section provides an overview of the runway capacity and delay modeling process and references the additional technical details of the simulation effort that can be found in the Draft EIS/EIR, the Supplemental DEIS/FEIR and in this Final EIS.

Figure 3.11-1 provides an overview of the modeling approach used to calculate changes in delay and shows how the runway capacity and delay modeling components are linked to the models used to simulate taxiway operations and estimate environmental impacts. This figure outlines the basic building blocks of the integrated modeling system and indicates the interactions between model components.

All of the modeling efforts were based upon either the historic activity at Logan in 1993 and 1998 or on the forecasts of future activity. These future fleet forecasts were supplemented with the analysis of Peak Period Pricing, which assessed how the fleets and demand profiles would be affected if Peak Period Pricing were implemented. The FLAPS (Flexible Airport Simulation) and DELAYSIM models were the key components of the runway capacity and delay analysis process. The primary function of FLAPS was to calculate the hourly capacity of each runway or set of runways that is used at Logan under different weather and demand conditions. The primary role of DELAYSIM was to determine the utilization of each runway configuration based on historical weather patterns and other operating constraints, and then to calculate the delay that would be experienced by comparing projected airfield demand to available runway capacity. Both FLAPS and DELAYSIM were used to provide inputs (exit use, schedules, and configuration utilization) to the Airport Machine model. The Airport Machine model was then used to evaluate demand, capacity, and delays on the taxiway system. Outputs from all of these models provided inputs to the environmental impact analysis.

Figure 3.11-1
Delay Modeling Approach



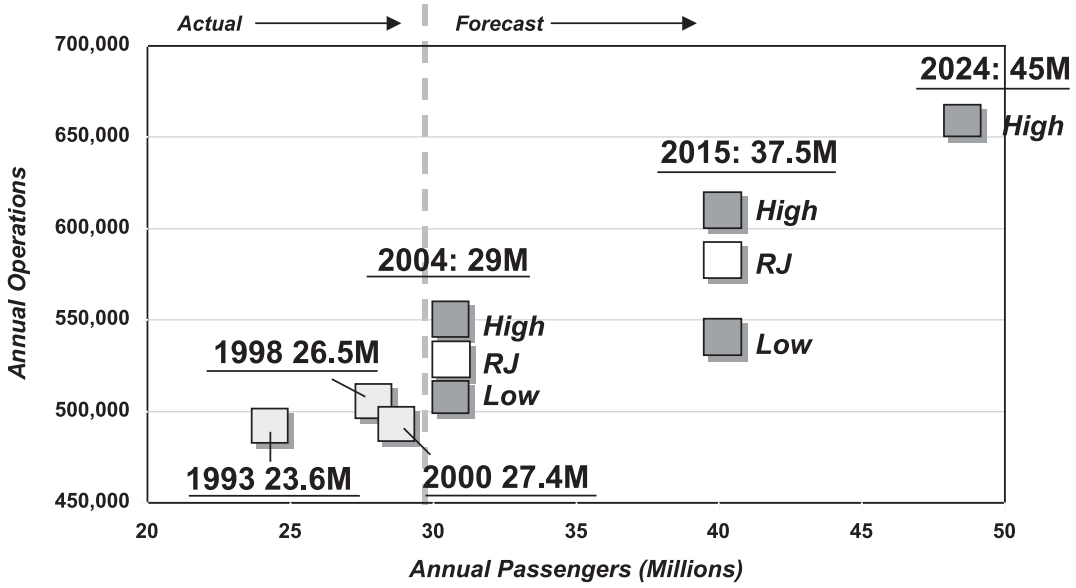
3.11.1 Forecasts of Passengers and Operations

For historic context, the Draft EIS/EIR examined 1993 conditions, a period of airline overscheduling and high delays. This analysis was updated in the Supplemental DEIS/FEIR through analysis of more recent 1998 conditions.

While development of regional transportation alternatives has slowed Logan passenger growth, Logan handled 27.4 million annual passengers in 2000. If the Airport remains on its current path, annual passenger demand is expected to reach 29 million passengers by the year 2004. This passenger level represents the near-term demand against which the proposed airside improvement alternatives were evaluated. In the longer term, Logan is expected to handle approximately 34 million passengers by 2010 and to reach 37.5 million passengers around 2015. The proposed airside improvement alternatives were evaluated against this long-term passenger level of 37.5 million. In addition, a higher passenger level of 45 million annual passengers, expected sometime after 2020, was also evaluated. Figure 3.11-2 shows the range of future near- and long-term planning scenarios examined throughout the Airside Project, as well as the level of activity in 2000. For each of the nine fleet scenarios, multiple improvement packages were considered.

The operational benefits and environmental impacts of the Preferred Alternative have been measured based on the levels of aircraft activity associated with the various near- and long-term passenger projections. For individual fleet scenarios, these impacts relate to the level and mix of activity, and not the specific year in which they may be realized.

Figure 3.11-2
Logan Airside Passenger and Fleet Forecasts



Projected operations at Logan Airport vary from 510,000 for the near-term 29 million passenger (29M) Low Fleet scenario to 656,000 for the long-term 45M High Fleet scenario. The High and Low scenarios for aircraft operations at each passenger level were developed during the Draft EIS/EIR process, and reflect different assumptions regarding the aircraft fleet mix at Logan. The Low scenarios assume more large jet aircraft operations and fewer non-jet operations, similar to recent conditions, while the High scenarios assume a greater proportion of smaller aircraft and thus a higher level of total operations. The specific fleet mix forecasts by aircraft type were presented in Appendix E of the Draft EIS/EIR, along with a detailed description of the forecast development process.

These fleet scenarios represent unconstrained forecasts of aircraft activity. It should be recognized that under certain of the longer-term High Fleet scenarios, intervening demand management initiatives would be expected to reduce the volume of aircraft activity, especially during peak periods. These activity reductions have been incorporated in the Alternatives that include Peak Period Pricing. Because demand management was treated as an Alternative in the analysis, it is appropriate for EIS purposes to include the unconstrained activity level as a No Action scenario.

Recent trends at Logan indicate an increased presence of regional jet aircraft, which have rapidly expanded service in the past 2 to 3 years. To examine the potential impacts that these 30- to 70-seat jet aircraft may have on the operational and environmental analysis of the proposed airside improvement alternatives, an additional long-term 37.5 million annual air passenger scenario was developed for the Supplemental DEIS/FEIR. This fleet, referred to as the 37.5M High RJ Fleet, reflected a high number of regional jet aircraft and a corresponding decline in non-jet operations.

As described in Section 3.4 of this Final EIS, a near-term RJ scenario was also developed. This 29M RJ scenario demonstrates the benefits of the Preferred Alternative under conditions likely to exist at about the time the proposed unidirectional Runway 14/32 enters service. The 29M RJ scenario falls in between the 29M Low and 29M High scenarios in terms of total operations, but assumes more regional jets and fewer non-jets than did the original 29M scenarios. The 29M RJ fleet scenario and its associated benefits are described in Section 3.4 of this Final EIS, and all of the various fleet scenarios are presented and compared in a single location in Appendix D of this Final EIS.

3.11.2 Runway Capacity Modeling

FLAPS (Flexible Airport Simulation Model), which is first in the modeling sequence, provides estimates of runway capacity. Model inputs include detailed representations of the three primary factors that affect capacity:

- Aircraft characteristics and fleet mix,
- Runway layout and availability, and
- Air traffic control tower (ATCT) operating procedures

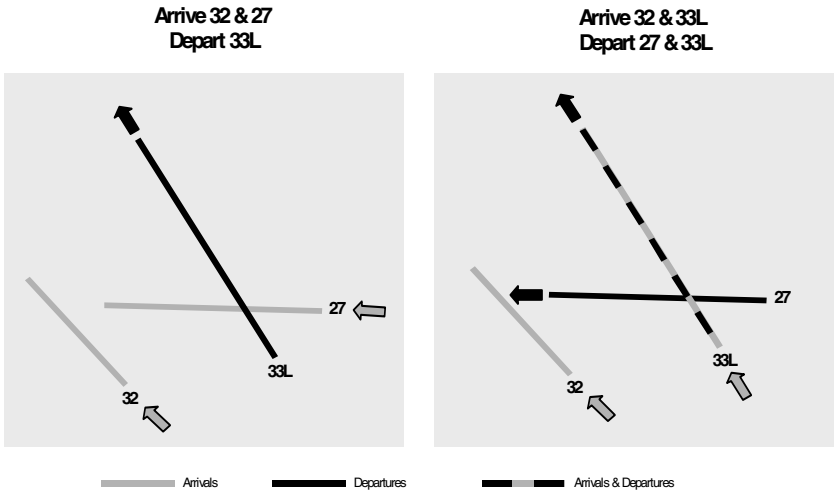
Fleet mix requirements include baseline or forecast operations by aircraft type. FLAPS uses fleet mix input files with individual aircraft types grouped into similar classes based on operating requirements and performance characteristics; these include runway length for takeoff and landing, jet versus propeller engines, and FAA aircraft weight class. FLAPS utilizes eighteen aircraft classes (nine arrival and nine departure) with distinct operating characteristics such as approach speed, braking distances, and runway occupancy times for both arrivals and departures. The fleet mix affects runway capacity because different classes of aircraft have different runway occupancy times and in-flight separation requirements. In addition to the detailed breakdown of fleet scenarios by aircraft type, Appendix D of this Final EIS also summarizes the takeoff and landing distance assumptions utilized in the analysis.

Runway layout input requirements include the orientation and length of each runway and the location and type (e.g., high speed) of runway exits. Air traffic control inputs include a range of operational factors such as the runways in use at specified times, the manner in which available runways are used (e.g., arrival only, departures only, and mixed arrivals and departures), runway assignments for specific aircraft types (e.g., small propeller only, all heavy jets, etc.), and the required separation between successive aircraft operations under different weather conditions. FLAPS recognizes seven distinct weather categories, each with different aircraft separation standards. Separation standards are a critical element of runway capacity calculations, since increased separation requirements effectively decrease runway capacity. FLAPS also utilizes fixed air traffic control (ATC) variables including the location of final approach fixes, runway restrictions due to noise abatement procedures, and operating restrictions for aircraft on dependent parallel runways and crossing runways. FAA ATC personnel reviewed the accuracy of all air traffic control inputs.

Combinations of physical runway layouts and ATC procedures are used to define various runway configurations. A single configuration consists of a single runway or set of runways in use and the ATC variables in effect at that time. In order to simulate operations accurately over the course of a year, every feasible runway configuration must be defined and incorporated in a model input file. At Logan where wind conditions often dictate the runway operating directions, sets of configurations exist for each primary operating direction (e.g., northeast using Runway 4, southwest using Runway 22, etc.), and variations in air traffic control procedures require subsets of the primary runway configurations. Because of the number of possible combinations, 85 configurations were defined for the improvement packages that include no new runway construction (Alternatives 2, 3 and 4), and an additional 26 configurations were required for the improvement packages that include Runway 14/32 (Alternatives 1 and 1A), for a total of 111 runway configurations.

While much of the discussion of Runway 14/32 has focused on the highest capacity three-runway configuration with arrivals on 33L/32 and departures on 33L & 27, it is important to recognize that Runway 14/32 can be utilized in combination with a number of different runways and operating modes. For example, Figure 3.11-3 shows two alternate configurations using Runway 32 for arrivals. The first is the high-capacity three- runway configuration that is used most frequently (arrivals on 33L/32 and departures on 33L & 27). The second configuration involves arrivals on Runways 32 & 27 and departures on Runway 33L. This alternate configuration for northwest operations has a slightly lower capacity, but it is frequently used in situations of low to moderate demand. This alternate configuration is available for selection under all analysis scenarios that include Runway 14/32, and the operational and environmental impacts associated with its use have been considered in all of the Airside analyses. The complete set of runway configurations included in all of the Airside modeling is presented graphically in Appendix D of this Final EIS.

Figure 3.11-3
Alternate Configurations for Northwest Operations with Arrivals on 32



The primary output of each FLAPS model run is the modeled capacity of a runway configuration, with this "saturation" capacity defined as the maximum number of aircraft arrivals and departures that can be achieved in one hour under specific fleet mix, weather conditions, and air traffic control conditions. This modeled capacity implies a high workload and no distractions for controllers, and it exceeds the level of activity that controllers can sustain for prolonged periods of time. Operational capacity, defined as 90 percent of the modeled capacity, represents the long-term operating levels that air traffic controllers achieve in practice. The DELAYSIM model uses operational capacity to select the optimal runway configuration (the Airport Machine also uses operational capacity to estimate taxiway utilization), but DELAYSIM uses the saturation capacity to calculate delays to avoid overestimating total delay. While ATC controllers have difficulty handling the modeled capacity for extended periods of time, they do achieve these higher levels during intervals of high demand when delays would accrue rapidly if capacity were limited to operational capacity. Throughout this Final EIS, capacities generally refer to the saturation capacities unless otherwise noted. Appendix D also includes tables summarizing the operational capacities of all of Logan's runway configurations under various fleet scenarios.

3.11.3 Runway Delay Modeling

The DELAYSIM model estimates annual delay based on the runway configuration capacity estimates made by FLAPS and the aircraft demand derived from annual operations forecasts and daily demand profiles. DELAYSIM is designed to estimate potential delay by selecting the runway configuration best able to accommodate airfield demand under specified weather and operational constraints. The Airside Project delay modeling used multiple years of actual hourly weather observations to simulate operations under realistic weather patterns at Logan. The analysis in the Draft EIS/EIR used ten years of hourly weather data (1981-1990), while the analysis in the Supplemental

DEIS/FEIR and this Final EIS used updated weather data representing the three-year period from 1997-1999. A separate DELAYSIM run was made for each of the 31 forecast scenario/improvement combinations, and additional runs were used to represent the historic 1993 and 1998 conditions. DELAYSIM selects the best runway configuration based on the following information:

- Hourly capacities of feasible runway configurations from FLAPS;
- Hourly profiles of the frequencies of jet and non-jet aircraft operations at Logan for weekdays, Saturdays, and Sundays adjusted for monthly variations;
- Hourly weather observations of wind, visibility, precipitation, and cloud ceiling heights at Logan;
- FAA wind rules used by the ATC tower to determine which runways can be used;
- Annual runway use targets and goals for noise dwell and persistence developed for the Preferential Runway Advisory System (PRAS); and,
- Air traffic controller workload associated with runway changes as approved by FAA ATC.

Simulating airport operations on an hour-by-hour basis, DELAYSIM first identifies available runway configurations based on wind, ceiling, visibility, precipitation, and time of day conditions. The model identifies which (if any) of these configurations has sufficient operational capacity to meet the demand in that hour. If none of the configurations has sufficient capacity, the model chooses the configuration with the highest capacity. If more than one configuration has enough capacity, DELAYSIM selects the configuration that best meets the objectives of achieving PRAS (Preferential Runway Advisory System) runway use goals and reducing controller workload. Once DELAYSIM selects a runway configuration, it calculates delays by comparing the saturation capacity of that configuration to the projected demand for aircraft operations in the hour being modeled.

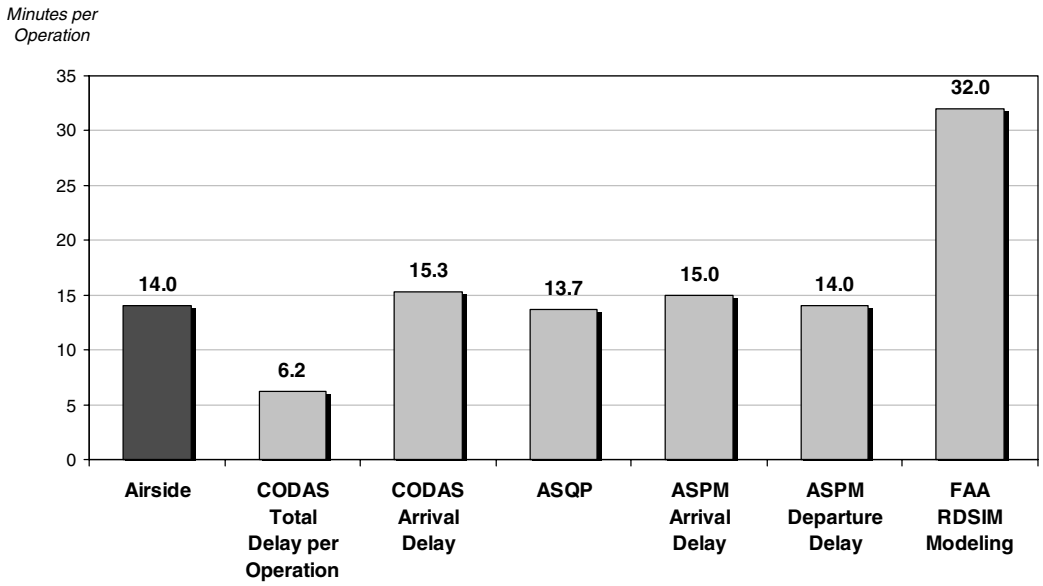
The DELAYSIM modeling process parallels the actual process followed by air traffic controllers, who select runway configuration based on operational capacity, but can handle aircraft at the higher modeled capacity for limited periods of time. The DELAYSIM process also reflects other actual operational constraints, such as avoiding a change in runway configuration during an air traffic controller shift change. All of the DELAYSIM results, both in terms of delays and runway use, are also summarized in Appendix D of this Final EIS, Appendix C of the Supplemental DEIS/FEIR, and Appendix H of the Draft EIS/EIR. By providing additional high capacity runway configurations that more nearly match the normal good weather operating capacity of Logan Airport, the proposed new unidirectional Runway 14/32 will provide more flexibility for ATC to select runway configurations that better achieve PRAS goals.

3.12 Consistency of Airside Delay Estimates with Published Delay Statistics

The US DOT and FAA maintain several publicly available databases on airline flight delays. Some reviewers have compared the results of the Airside delay modeling for Logan Airport to the Total Delay per Operation statistic from the FAA Consolidated Operations and Delay Analysis System (CODAS) and have noted that the Airside delay estimates for Logan are higher than those recorded by the FAA. This section demonstrates that the Airside modeled delay estimates are consistent with all reported delay measures except the Total Delay per Operation measure in CODAS.

CODAS is no longer used by the FAA and has been replaced with the Aviation System Performance Metrics (ASPM). The ASPM data, as well as other published delay databases, show average delays at Logan that are similar to those estimated by the Airside DELAYSIM model. (See Figure 3.12-1)

Figure 3.12-1
Comparison of Various Measures of Average Delay at Logan in 1998



3.12.1 Available Delay Statistics Validate the DELAYSIM Modeling

As described in Section 1.4 of the Supplemental DEIS/FEIR, delay estimates produced by the DELAYSIM model are not directly comparable to existing reported delay data. The DELAYSIM estimates include cancellations, delays of short duration (i.e., less than 15 minutes) or delays incurred at other locations, and are not impacted by delays at other airports since the model considers only the delays related to Logan runway capacity. For all of these reasons, the estimates produced by DELAYSIM are a better measure than reported delay statistics for evaluating the impacts and benefits of the proposed Airside improvements.

Although existing delay databases exclude valid delays such as cancellations and may include delays attributable to other airports, the average reported delays for all data sources except CODAS are consistent with the average delays estimated by the Airside DEALYSIM model. In the Airside Project EIS, the 1993 and 1998 scenarios were modeled to represent historic conditions at Logan. Statistics from the Airline Service Quality Performance (ASQP) System and the ASPM, as well as by the results of previous FAA modeling efforts, validate the Airside Project EIS delay estimates.

3.12.1.1 Airline Service Quality Report (ASQP)

ASQP data are collected by the US DOT to calculate on-time performance for the monthly Air Travel Consumer Report (ATCR). Data are reported for the ten largest US carriers based on domestic scheduled passenger revenues. As a result, smaller air carrier, commuter, charter, GA, cargo, military, and international flights are not captured in the ASQP. Because of this, the percentage of total operations included in ASQP varies with the traffic mix at each airport. At Logan, ASQP recorded 197,000 scheduled operations in 1998, less than 40 percent of the 507,000 annual operations completed at the airport. According to the FAA's CODAS documentation for ASQP, "At those airports where a significant portion of operations is not reported, the ground movement and flight times may be biased." [33]

While ASQP only includes data for the ten largest air carriers, the data are available on a flight-by-flight basis, allowing for in-depth analysis. Because airlines add time to their schedules to improve on-time performance, these reported delays should be considered conservative estimates of the delays actually incurred by each aircraft. It should also be noted that ASQP recorded 8,646 cancellations and diversions at Logan in 1998 (approximately 4 percent of recorded activity), to which no delay was attributed.

Table 3.12-1 compares the 1998 ASQP data for Logan with the DELAYSIM results and presents average delays, as well as the distribution of operations by the duration of delay. When average delays are compared, both ASQP and DELAYSIM recorded approximately 14 minutes of delay per operation. If the ASQP delays are adjusted to include all Logan

33 Documentation for the Consolidated Operations and Delay Analysis System, FAA Office of Aviation Policy and Plans, September 1997, pg. 6.

demand (rather than the 39 percent captured in the database), ASQP counted approximately 117,000 annual hours of delay, compared to the 120,000 hours estimated by DELAYSIM.

Table 3.12-1
Comparison of Airside Modeled Delays with ASQP Delays

Delay Duration (minutes)	1998 ASQP Database				1998 Airside Simulation			
	Operations		Delay		Operations		Delay	
	Annual	Pct	Hours	Min/Op	Annual	Pct	Hours	Min/Op
0-15	145,974	77.6%	5,727	2.4	441,826	86.0%	14,067	1.9
16-30	18,124	9.6%	6,624	21.9	17,881	3.5%	6,453	21.7
31-60	12,739	6.8%	9,056	42.7	18,908	3.7%	13,791	43.8
61-180	10,129	5.4%	16,660	98.7	26,872	5.2%	47,159	105.3
181+	1,225	0.7%	4,858	237.9	8,324	1.6%	38,430	277.0
Total	188,191	100.0%	42,925	13.7	513,811	100.0%	119,900	14.0

Note: ASQP also recorded 8,646 flights that were diverted or cancelled, but did not record any delay for these flights.

If the distribution of delays by duration is considered, the ASQP and DELAYSIM results are also similar. ASQP reports a slightly lower share of on-time operations (those delayed less than 15 minutes), with corresponding increases in the share of operations delayed 16-30 or 31 – 60 minutes. The higher share of delayed operations in the ASQP data can be attributed to the fact that the ASQP delays include mechanical delays and delays caused by other airports while DELAYSIM only records delays caused by Logan's runway capacity constraints. Both the Airside and ASQP analysis show between 6 and 7 percent of flights delayed over an hour, with DELAYSIM showing a slightly higher percentage of these delays because it assumes all flights are completed (rather than canceling those with long delays). Overall, the ASQP data are very similar to the Airside estimates and demonstrate the reasonableness of the DELAYSIM modeling.

3.12.1.2 FAA Aviation System Performance Metrics (ASPM)

The ASPM system is FAA's replacement delay data source for CODAS. Instead of using ASQP data, it uses the actual OOOI (On-Off-Out-In) times from the Aircraft Communication Reporting and Addressing (ACARS) sensors, processed by Aeronautical Radio, Inc (ARINC). In addition, it incorporates data from the Enhanced Traffic Management System, which supports the daily management of the air traffic control (ATC) system. ETMS data are collected automatically in the Air Route Traffic Control Center (ARTCC) computers for Instrument Flight Rules (IFR) flights, including most commercial operations. Although ETMS theoretically records all controlled traffic, in practice some flight information may not be recorded due to communication or computer problems. In addition, when ARTCC computers are particularly busy, they may temporarily cease to generate some ETMS messages.

ASPM also incorporates schedule information from the Official Airline Guide (OAG), as well as data from the FAA Command Center on runway configurations, arrival and

departure rates, and actual traffic counts by hour. ASPM data is available from 1998, but the FAA Command Center information (which would be particularly useful for analyzing Logan delays and operations) is only available from January 29, 2000 forward.

Table 3.12-2 compares the DELAYSIM and ASPM measures for 1998. According to ASPM, the average arrival to Logan was 15 minutes late and the average departure was 14 minutes late. As with the ASQP data, the ASPM system records a lower share of on-time operations (those delayed less than 15 minutes) than DELAYSIM. In general, the measured 1998 delays are very similar.

Table 3.12-2
Comparison of Airside Modeled Delays with ASPM Delays at Logan for 1998

Measure	ASPM	Airside
Pct of Arrivals Delayed > 15 min	26.7%	14.0%
Pct of Departures Delayed > 15 min	25.2%	
Average Arrival Delay (min)	15.0	14.0
Average Departure Delay (min)	14.0	

Source: FAA, ASPM Database and Logan Airside EIS.

3.12.1.3 FAA Capacity Enhancement Task Force

In 1992, the FAA Technical Center simulated Logan airfield operations with the RDSIM model and estimated that at a level of approximately 504,000 annual operations, total delay would exceed 268,700 hours per year. This greatly exceeds the Airside estimate of 119,900 annual hours of runway delay in 1998 for a similar demand level. The FAA supports the use of simulation modeling in evaluating major investments such as new runways, and has characterized the Airside delay estimates as reasonable and conservative in comparison to prior FAA simulation modeling at Logan.

3.12.1.4 Consolidated Operations and Delay Analysis System (CODAS)

CODAS integrates data from two primary sources: the Enhanced Traffic Management System (ETMS) and the Airline Service Quality Performance (ASQP) System. It supplements these sources with OAG schedule data and the carriers' Computerized Reservations Systems (CRS), and incorporates gate-hold data from the Air Transport Association (ATA). Each of these data sources was created for a different purpose, and each has unique strengths and limitations. The FAA no longer uses the CODAS system and has replaced it with the ASPM system.

Using the DELAYSIM model, the Airside Project calculated average delays of 14.0 minutes per operation in 1998, while CODAS estimated 6.2 minutes of Total Delay per Operation for the same period. However, the newer ASPM database for 1998 indicates that arrivals at Logan were delayed by an average of 15.0 minutes per operation, and departures were delayed by an average of 14.0 minutes per operation. These ASPM statistics are consistent with the DELAYSIM results, which showed average Logan delays of 14.0 minutes in 1998. (See Table 3.12-2)

The reasons why the CODAS Total Delay per Operation statistic underestimates Logan delays are discussed further in the following sections.

CODAS Data is Estimated from Other Sources and is Incomplete

None of the data sources that CODAS relies on was designed to provide data to the CODAS delay system. Since none of the CODAS data sources contain complete information for Logan operations, the CODAS Total Delay per Operation statistic understates actual flight delays at Logan Airport. The CODAS manual specifically states that, "Analysts must recognize the limitations of the basic data sources and remember that the CODAS-reported delays are estimates and not actual measures of delay." [34]

CODAS Excludes Cancellations

The principal reason why CODAS underestimates delays caused by Logan Airport is that the system excludes cancelled flights. Cancellations are a form of delay and contribute significantly to both airline and passenger delay costs. When a flight is cancelled, aircraft and crews must be reassigned or rerouted, and passengers must be rescheduled. The US DOT estimated that in 1999, each cancellation cost air carriers between $3,500 and $6,700.[35] This means that in terms of air carrier direct operating costs, a cancellation is approximately equal to a delay of 1-1/2 to 3 hours. Thus, excluding cancellations severely underestimates the impacts of delays at an airport.

This is particularly true for Logan, which has the second highest cancellation rate among U.S. Large Hub airports (see Table 3.12-3). For the 12-months ending March 2001, approximately seven percent of scheduled Logan operations were cancelled compared with approximately four percent for Large Hubs on average. In addition, the Logan cancellation rates are conservative since they exclude regional carriers with smaller aircraft that are more likely to cancel flights during periods of high delay or bad weather.

34 Documentation for the Consolidated Operations and Delay Analysis System, FAA Office of Aviation Policy and Plans, September 1997, pg. 4.
35 "Air Carrier Flight Delays and Cancellation", Office of Inspector General Audit Report, July 25, 2000, pg. 41.

Table 3.12-3
Cancelled Flights at U.S. Large Hub Airports

Rank	Airport	Departures and Arrivals		Percent
		Performed	Scheduled	Cancelled
1	New York LaGuardia	261,713	288,054	9.14%
2	**Boston**	**272,607**	**293,979**	**7.27%**
3	Chicago O'Hare	687,182	739,935	7.13%
4	New York Newark	302,011	321,481	6.06%
5	Cincinnati	338,498	357,494	5.31%
6	Washington Dulles	128,698	135,798	5.23%
7	San Francisco	254,919	268,324	5.00%
8	Philadelphia	253,927	266,572	4.74%
9	Dallas/Fort Worth	700,808	733,772	4.49%
10	Washington National	184,274	192,870	4.46%
11	New York J F Kennedy	177,999	185,426	4.01%
12	Los Angeles	473,752	493,224	3.95%
13	Seattle/Tacoma	292,786	304,077	3.71%
14	Atlanta	770,552	798,533	3.50%
15	Denver	368,613	381,771	3.45%
16	Pittsburgh	232,864	240,397	3.13%
17	Portland	170,479	175,681	2.96%
18	Charlotte	262,765	270,748	2.95%
19	St. Louis	390,126	401,943	2.94%
20	Miami	165,514	170,364	2.85%
21	Orlando	255,063	262,152	2.70%
22	San Diego	159,632	163,874	2.59%
23	Phoenix	369,596	379,369	2.58%
24	Honolulu	137,635	141,005	2.39%
25	Houston Intercontinental	377,579	386,342	2.27%
26	Salt Lake City	158,632	162,153	2.17%
27	Chicago Midway	168,606	172,132	2.05%
28	Detroit	191,331	194,801	1.78%
29	Minneapolis	183,118	186,393	1.76%
30	Tampa	142,507	145,038	1.75%
31	Fort Lauderdale	128,056	130,244	1.68%
32	Baltimore	192,275	195,455	1.63%
33	Las Vegas	296,737	300,993	1.41%
	Total	9,450,854	9,840,394	3.96%

Note: Excludes Northwest airlines because of reporting problem.
Source: US DOT, T100 Database, 12 months ending March 31, 2001.

Since cancellations occur disproportionately under high delay conditions, the CODAS data exclude flights on days with the highest average delays. Table 3.12-4 presents an analysis of ASQP data for 1998. It demonstrates that on days with light delays (the 257 days with average daily delays under 15 minutes per operation), Logan had a cancellation rate of approximately 3 percent (similar to the rest of the nation). However, on days with high delays (the 41 days with average daily delays greater than 30 minutes per operation), more than ten percent of Logan's flights were cancelled.

Table 3.12-4
Logan Flight Cancellations by Average Daily Delay

Daily Average Delay (minutes)	Days		Arrivals				Percent of Total Cancellations
	Number	Pct.	Scheduled	Performed	Cancelled	Pct. Cancelled	
0-15	257	70.4%	68,656	66,648	2,008	2.92%	49.7%
16-30	67	18.4%	18,552	17,659	893	4.81%	22.1%
Over 30	41	11.2%	11,214	10,075	1,139	10.16%	28.2%
Total	365	100.0%	98,422	94,382	4,040	4.10%	100.0%

Source: ASQP Database, CY 1998.

CODAS Total Delay per Operation Excludes Gate-Holds Caused by Logan

Table 3.12-5 compares the CODAS delay rankings for Large Hub airports for CY 2000 and demonstrates the severity of Logan's delay problem. Logan is the 5th most delayed airport in terms of Total Delay per Operation and the 3rd most delayed airport in terms of Arrival Delay. CODAS compiles four primary delay statistics for each flight: Airborne Delay, Adjusted Gate Delay, Taxi-Out Delay, and Taxi-In Delay. Inbound Delays include the Airborne and Taxi-In Delays for arrivals, while Outbound Delays include the Adjusted Gate Delay and Taxi-Out Delay for departures. The Total Delay per Operation is determined by combining the Inbound and Outbound Delays for an individual airport in an attempt to address causality in the CODAS database. CODAS also records EDCT (Expected Departure Clearance Time) Where Taken and EDCT Where Caused Delay, Arrival Delay, and Unadjusted Gate Delay.

Table 3.12-5
CODAS Delay Rankings for Large Hub Airports – CY 2000

	EDCT Where Taken		EDCT Where Caused		Total Per Operation		Arrival	
Airport	Delay	Rank	Delay	Rank	Delay	Rank	Delay	Rank
ATL	0.7	12	1.5	8	8.3	4	15.2	10
BOS	**0.8**	**8**	**3.0**	**5**	**8.0**	**5**	**20.1**	**3**
BWI	0.6	18	0.0	21	3.6	26	13.8	18
CLT	0.6	17	0.1	18	5.9	14	10.7	29
CVG	0.5	24	0.2	17	5.2	19	13.7	19
DCA	1.0	3	0.0	21	5.6	17	11.5	27
DEN	0.7	9	-	24	5.1	21	15.1	11
DFW	0.5	27	0.3	14	7.1	9	11.9	23
DTW	0.6	19	0.2	16	7.6	7	12.3	22
EWR	0.6	15	4.2	3	10.5	2	19.2	5
HNL	0.2	29	-	24	2.7	29	18.1	6
IAH	0.9	5	0.5	12	5.8	15	11.8	24
JFK	0.7	11	0.6	11	7.7	6	17.2	8
LAS	0.8	6	0.1	20	4.5	24	14.8	13
LAX	0.6	15	1.2	9	6.3	12	16.8	9
LGA	0.5	24	8.6	1	12.4	1	25.5	1
MCO	1.1	2	0.0	21	4.1	25	14.5	14
MIA	1.0	4	-	24	5.5	18	14.4	15
MSP	0.6	20	0.4	13	6.8	10	11.6	26
ORD	0.4	28	3.9	4	7.6	7	20.0	4
PHL	0.6	13	1.8	7	10.0	3	17.7	7
PHX	0.7	10	0.7	10	5.6	16	14.9	12
PIT	0.5	23	0.1	19	5.0	22	11.5	28
SAN	1.3	1	-	24	3.3	27	13.9	17
SEA	0.6	20	0.3	14	4.6	23	14.1	16
SFO	0.5	22	5.7	2	5.9	13	22.4	2
SLC	0.6	13	-	24	5.1	20	11.6	25
STL	0.5	24	1.9	6	6.4	11	13.4	20
TPA	0.8	6	-	24	3.2	28	12.9	21

Source: CODAS Database. CY 2000

A benefit of the Total Delay per Operation methodology is that it avoids assigning delays to a destination airport when a flight had departure-related delays at the origin airport. Consider a flight that departed ten minutes late from LaGuardia due to taxiway congestion and therefore arrived ten minutes late at Logan. This delay would not be counted in the Total Delay per Operation for Logan, but it would be counted in the Total Delay per Operation for LaGuardia (as Taxi-Out Delay).

A problem with the Total Delay per Operation methodology is that it fails to allocate delays that are associated with gate-holds and ground delay programs caused by the destination airport to the destination airport. Consider a case where northwest winds at Logan caused a LaGuardia departure to be held on the ground for ten minutes. This delay would not be counted in the Total Delay per Operation for Logan, but would instead be counted in the Total Delay per Operation for LaGuardia (as Adjusted Gate Delay). Therefore, at an airport like Logan, which often causes gate-holds at other airports, the Total Delay per Operation statistic underestimates the delays caused by Logan.

This point is supported by an analysis of the EDCT Where Taken Delay and EDCT Where Caused Delay statistics, which consider the reasons for gate-holds. Using the above northwest winds example, LaGuardia would accumulate ten minutes of EDCT Where Taken Delay, while Logan would accumulate ten minutes of EDCT Where Caused Delay. Logan experienced 3.0 minutes per arrival of EDCT Where Caused Delay, but only 0.8 minutes per departure of EDCT Where Taken Delay (see Table 3.12-5). This demonstrates that Logan caused significantly more gate-holds at other airports than it experienced due to delays at those other airports. In fact, the only airports with greater EDCT Where Caused Delays (and similarly low EDCT Where Taken Delays) are LaGuardia, San Francisco, Newark, and Chicago O'Hare. Backups at these four airports are noted for causing delays throughout the entire air traffic control system.

CODAS Arrival Delay is Consistent with Airside Estimates

Since Total Delay per Operation ignores Logan delays incurred at other airports, a more appropriate statistic for examining delays caused at Logan is CODAS Arrival Delay, which is simply the difference between the actual and scheduled arrival times, assigned as delay to the destination airport. As shown in Table 3.12-5, CODAS Arrival Delay at Logan averaged 20.1 minutes per arrival in 2000 compared to the 8.0 minutes of CODAS Total Delay per Operation. While the Arrival Delay metric does not attempt to address causality in the manner of the Total Delay per Operation metric, it does incorporate those delays caused by Logan and incurred at other airports.

For 1998, the year modeled in the Airside Project EIS, the CODAS Arrival Delay statistic for Logan is 15.3 minutes, which is similar to the 14.0 minutes of average delay per operation generated by DELAYSIM.

The CODAS Arrival Delay estimates should be considered conservative, as airlines increasingly pad their schedules to improve on-time performance. Between 1988 and 1999, scheduled Logan flight times increased by over six minutes.[36] This means that airlines are actually building delay into their schedules, and increasing that "scheduled delay" over time. Since the CODAS Arrival Delay estimate is based on scheduled arrival times, the actual delays incurred by aircraft would be higher.

36 "Air Carrier Flight Delays and Cancellation", Office of Inspector General Audit Report, July 25,2000, pg. 43.

3.12.2 Conclusion

This section examined the various delay databases available from the FAA and the US DOT and demonstrated that while the CODAS Total Delay per Operation statistic is not an accurate measure of Logan-caused delays, other delay metrics can be used to validate the DELAYSIM modeling.

- The Airside modeled delays are much more conservative than the delays generated by the FAA's Technical Center. While the DELAYSIM model estimated 119,900 hours of delay for 1998, the FAA simulation showed 268,700 hours of delay for a similar demand level.
- According to the ASPM, which has replaced CODAS, arrivals at Logan were delayed by an average of 15.0 minutes per operation and departures were delayed by an average of 14.0 minutes per operation in 1998. These statistics are consistent with the DELAYSIM results, which showed average Logan delays of 14.0 minutes in 1998.
- ASQP data show 13.7 minutes of average delay per operation, compared to the 14.0 minutes estimated by DELAYSIM. In addition, the distribution of ASQP delays by duration is very similar to the distribution of Airside modeled delays.
- The average delay per operation generated by DELAYSIM is also similar to the CODAS Arrival Delay statistic (14.0 minutes vs. 15.3 minutes).